ELECTRICAL REVIEW

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12th November, 1948

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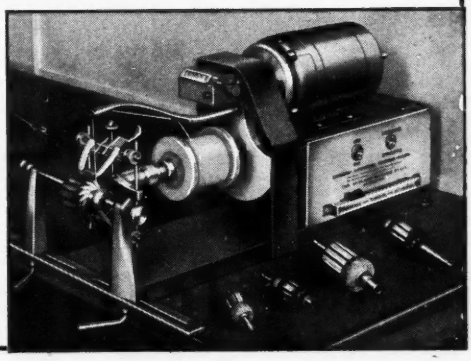

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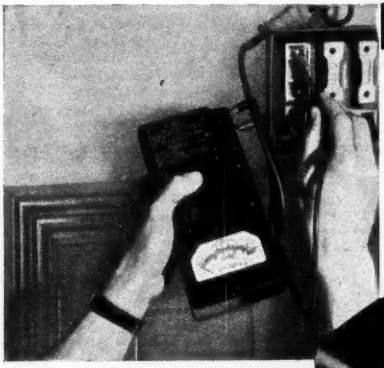

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER

ESTABLISHED 1872

Vol. CXLIII. No. 3703
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D.C. Transmission

NEED FOR EXPERIMENTAL WORK IN THIS COUNTRY

MUCH has been written about the use of direct current at high voltages since its potentialities for transmitting power over very long distances were discussed in these columns nearly ten years ago. We then pointed out that, however limited the scope for d.c. might be in this country, manufacturers here ought to be technically equipped to meet future requirements abroad. At that time the subject may have seemed of academic interest only, but now—for reasons advanced in last week's leading article—its practical bearing is more obvious.

Technical and Economic Problems

The general advantages of d.c. transmission have been dealt with by us on several occasions, as have also the problems to be tackled, which are technical as well as economic. While those relating to the line itself (whether overhead or underground) are well within sight of solution, the field for d.c.—until circuit breakers of high rupturing capacity have been evolved—will be restricted to point-to-point transmission.

Such a restriction is of little moment in many parts of the world, as Mr. F. J. Erroll and Lord Forrester showed in their I.E.E. paper last week with amplification by the second author in his opening remarks by radio-telephone from Toronto. This is especially the case where some miles of submarine cable are involved or where routes between hitherto unexploited water-power resources and load centres are long enough to allow the lower costs of d.c. lines as such to outweigh heavier expenditure on terminal apparatus. As to whether the methods of conversion from and to a.c. experimented with to date are likely to be ultimately adopted, we share the doubts expressed in some quarters and believe that an opportunity is here presented for British electrical engineers to place the world once more in their debt.

The fuller knowledge possessed of a.c. technique, which is largely based on experience with lower voltages and shorter distances, does not warrant the assumption that (under the conditions envisaged by the authors) it would be more feasible than d.c. Even if means of securing system stability are understood, for instance, their economic application is another matter. Opinions differ, too, as to whether when plotting overall costs against mileage for the two systems the curves would intersect at an acute angle or run more nearly parallel over a fairly wide range.

Utilizing Untapped Power Resources

Although comparisons between a.c. and d.c. are to some extent inevitable, it would be a mistake to regard the aspects now under discussion as representing another "battle of the systems." The point is whether in certain circumstances d.c. is likely to provide a more economical or more practicable way of bringing into fuller use still untapped power resources of the world. There is no question of turning aside from efforts to produce in quantity what is necessary to meet immediate needs, but rather one of starting research that may come to fruition some years hence. In Sweden, for example, the

undoubtedly correct decision to meet more immediate needs with a.c. at 380 kV has not halted d.c. research; nor did the war in Germany.

When discussing the future of d.c. transmission last April, we suggested that a section of the grid (which has provided so valuable a high-voltage field laboratory on previous occasions) should be allocated to d.c. experimental work. British electrical engineers require experience to sustain their traditional role as pioneers abroad of developments that have been tested under commercial conditions here, thus enabling other countries to exchange their primary products for manufactured products from this country. This raises the question of whether the development costs should be borne wholly by consumers of electricity here or whether the D.S.I.R. should make a special subvention for work that is likely to be of ultimate benefit to the public at large.

CONVENTION EXHIBITION

WHEN electrical manufacturers exhibited at former I.M.E.A. conventions they knew that they displayed their goods to three hundred and seventy potential customers (apart from the general public). An exhibition will be a feature of the first National Electric Power Convention at Torquay next year. How many potential buyers will see it ? Fourteen (Area Boards), 80 or so (sub-areas) or 500 to 600 (districts) ? This depends on the buying policy adopted by the new authorities—a matter which was touched upon in our leading article of 22nd October. At all events it is well to know that manufacturers are to be encouraged to show their wares and we hope that they will derive good from the exhibition.

ASYNCHRONOUS GENERATORS

WHERE steam is required for process or heat in a factory but the quantity is small in relation to the demand for power, the use of back-pressure plant has not generally proved economical. The two demands do not necessarily coincide, but divergencies can be smoothed out by connecting the private plant to the public mains. Running in synchronism presents difficulties which would be obviated, it was suggested by Mr. F. Buckingham to the Manchester Association of Engineers (p. 738), if asynchronous generators were installed, as they would be little different from induction motors in their operation. We cannot recall the use of such machines in this way, but the method seems worth trying.

INTERFERENCE WITH BROADCASTING

IN 1936 a committee of the Institution of Electrical Engineers reported in favour of suppressing at the source interference with wireless telegraphy. The recommendation that the Post Office should shoulder responsibility for securing the observance of regulations received our support, as that Department benefits by the revenue from licences. This provision is an important feature of the new Bill. Another good point is that the regulations will be made after consultation with an advisory committee to be appointed by the Institution.

DOMESTIC HOT WATER

How to obtain the 8 gal per min of hot water from a storage tank prescribed in Codes of Practice without undue mixing with the cold inflow forms the subject of a new E.R.A. Report Y/T12. Photographs illustrating the effect on stratification of coloured replacement water in a transparent cylinder aid in demonstrating that, after the initial mixing, stratification is not materially disturbed, provided water is not drawn off below 140 deg F. Some improvement may be gained by breaking up the incoming jet into smaller ones of low velocity and using a cylindrical rather than a rectangular tank. It seems likely that more than the standard 8 gal per min could be obtained without detriment.

LIMITED CONTRACTS

SMALLER electrical contractors will be badly hit if the practice approved by the Derby Corporation becomes common. This was a decision to place all electrical installation work up to the value of £600 with the local sub-area of the East Midlands Electricity Board. In defence of the proposal it was said that the system had been in force, in relation to the Corporation's own Electricity Department, since 1943 and that no more favourable terms would be obtained than were offered by the Board because they would be on the same scale as in 1943. In our opinion this statement should be tested in the proper way—by putting out contracts to tender.

Lift Safety

Improved Ultimate Limit Switch

By F. P. PHILLIPS,
B.Sc., A.M.I.E.E., A.M.I.Mech.E.

IF a lift fails to stop when the cage reaches its upper or lower terminal floor, the cage or balance weight is brought to rest only by violent and destructive contact with the top structure. This is particularly dangerous when the ropes are positively anchored to the winding drum, and the writer knows of several such accidents.

Lifts are commonly fitted with main current over-run limit switches intended to function only after failure of the normal stopping devices at the top and bottom floors. Experience has shown that, even with the usual automatic features, over running does occasionally occur and cause the ultimate switches to function. Such overwinding may be caused by a control gear failure, by overloading or by a maladjusted brake. Over-running is more frequent with excessive decking speeds and inadequate headroom under the machinery, the latter necessitating the setting of the ultimate switch too close to the normal terminal position.

Even when the ultimate limit switch has functioned satisfactorily, the cage has to be got back into the zone controlled by the normal automatic or manually operated control gear. Hand winding is a long and arduous method of doing this and becomes almost impossible on heavy lifts; the brake must be lifted or wedged up, and this introduces a danger because even a non-reversible worm will sometimes run if once started, especially with some modern high efficiency designs. Another way is by electrically short-circuiting the limit switch, but this suffers from the drawback that the short-circuit connections may be forgotten. A third way entails the mechanical dismantling of the limit switch operating gear, but this may also be forgotten afterwards.

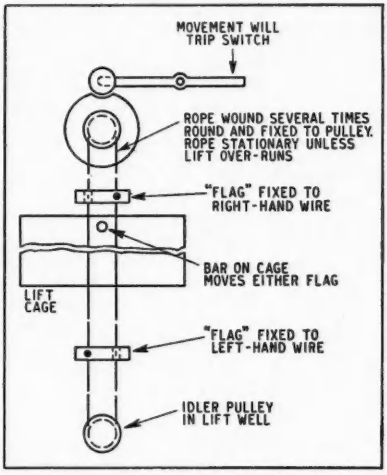

MOVEMENT WILL TRIP SWITCH
ROPE WOUND SEVERAL TIMES ROUND AND FIXED TO PULLEY. ROPE STATIONARY UNLESS LIFT OVER-RUNS
"FLAG" FIXED TO RIGHT-HAND WIRE
BAR ON CAGE MOVES EITHER FLAG
LIFT CAGE
"FLAG" FIXED TO LEFT-HAND WIRE
IDLER PULLEY IN LIFT WELL

Fig. 1.—Common type of ultimate limit switch-operating gear

In some designs the ultimate switch is closed temporarily so that the lift cage may be brought back into the normally controlled zone. In one form the switch is spring biased to the open position and held closed by a latch, which is tripped on the occurrence of an over-run. A hand lever allows the switch to be held closed while the lift is driven back to its normal operating zone. Disadvantages are that the handle can be tied in the closed position and that the normal opening movement depends on springs, allowing the contacts to stick in the closed position because they are not forced apart by the operating mechanism.

In a second common design the switch, which may include the foregoing features, is operated by a mechanism capable of being readily manipulated to allow it to be closed after an over-run. If over-travel occurs in either direction the bar attached to the lift cage moves one of the "flags" or "ruffs" (Fig. 1) and so causes rotation of the cam fixed to the pulley at the top of the well, movement in either direction tripping the switch. The latter can be reclosed by turning the cam about 360 deg in the direction in which it has been turned by the over-run. This manipulation of the cam causes both "flags" to move—the top one up and the bottom one down. Failure to re-set the mechanism therefore leaves the lift virtually without limit switch protection. If the switch can function at all it can do so only after the lift has travelled beyond its intended emergency stop position by a distance equal to the circumference of the top pulley.

The risk can be reduced by fixing both " flags " to the same wire, because failure to restore the cam to its normal position after an over-run will leave one of the " flags " in such a position that it will trip the switch too early. The contention that this eliminates the danger because the first journey of the lift will draw attention to the unrestored mechanism is a poor one, because the warning occurs only if the lift is driven to the requisite terminal floor and this may not be done at once.

The Nature of the Problem

The above notes indicate that an ultimate limit switch and its associated mechanism should meet the following conditions. First, the switch must be capable of being reclosed after an over-run by manipulation of the operating mechanism so that at no time is the lift without protection against another over-run. Secondly, it should carry the main current and be triple-pole and quick-break; it should open irrespective of spring failure, corroded bearings, etc., and be incapable of being held or tied closed despite functioning of the opening mechanism. The last two considerations are of great importance because the switch may be required to operate after years of idleness.

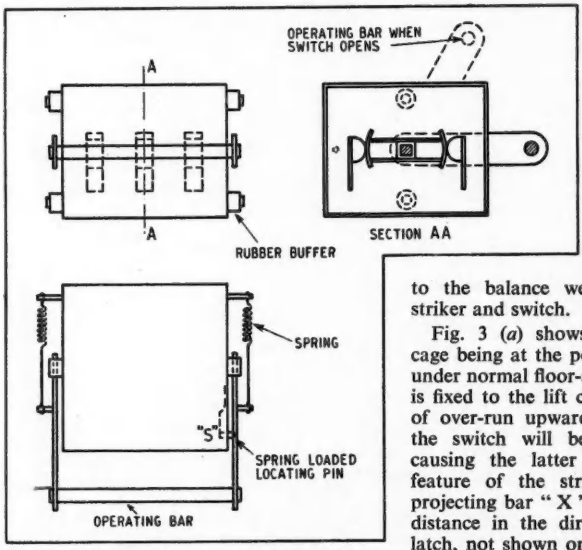


Fig. 2.—Construction of special limit switch

A new arrangement utilizes a switch (Fig. 2) having heavy controller type contacts which are forced open by movement of the operating bar, irrespective of the opening force of the springs, which serve only to cause quick break and wide contact separation. There is nothing novel in the switch design, but most limit switches rely on springs or weights for contact separation. It is difficult to avoid this defect if quick make is required. The latter feature is, however, unnecessary for the present purpose because the switch is never closed on load. The novel feature is the simple mechanism by which the switch is operated.

In the preferred arrangement two switches are located in the lift well. One protects against over-hoisting of the lift cage and one against over-hoisting of the balance weight. The mode of operation is shown in successive stages in Fig. 3, over-hoisting of the cage being assumed. Reference is made to the cage only, but a similar description would apply to the balance weight and its associated striker and switch.

Fig. 3 (*a*) shows the switch closed, the cage being at the point where it should stop under normal floor-switch control. A striker is fixed to the lift cage so that, in the event of over-run upwards, the operating bar of the switch will be pushed upwards thus causing the latter to open. The special feature of the striker device is that the projecting bar " X " can be moved a limited distance in the direction of lift travel. A latch, not shown on the diagram, allows the bar " X " to be retained in the raised position when required.

Operation on Over-Running

In Fig. 3 (*b*) the cage has over-run and the striker has pushed the switch operating bar so far that the spring-loaded locating pin " S " (Fig. 2) no longer locates the switch in the " on " position; Fig. 2 shows that the springs tend to open the switch immediately the operating arms are moved away from dead centre in either direction. At 3 (*c*) the switch has opened under spring action; if it had stuck, the striker would have imposed the full power of the lift to force the contacts

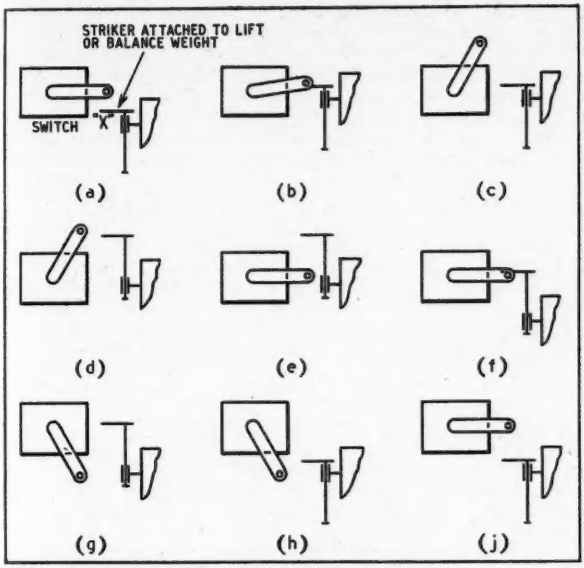


Fig. 3.—Stages in operation of limit switch by sliding striker on cage or weight

open. The lift has come to rest at (*d*). The electrician has raised the striker bar to the position shown, where it remains on account of the latch, and the switch can now be closed (*e*). The operating bar passes clear of the striker and the lift can be driven back, under power, to its normal operating zone.

In Fig. 3 (*f*) the lift is moving down and the striker is pushing the switch operating bar down, thus once more opening the switch as at (*g*), and stopping the lift. At (*h*) the striker has been pushed down by the electrician to its lower and normal position, and at (*j*) the switch has been closed and conditions are thus restored to normal as in (*a*).

Throughout these manipulations nothing is dismantled and the lift cannot be left without limit switch protection, even if the electrician leaves his work unfinished, with the partial exception indicated in 3 (*e*). In this condition, the lift, which is already above the top floor, can be driven a further short distance up by careless operation or a fault. This is unlikely to be serious because the lift is already near its buffers and cannot attain high speed in such a short distance and because the control gear will, in most cases, prevent the lift from travelling upward at all.

The arrangement just described requires a switch and striker for both cage and weight; alternatively the cage may operate both switches, one being located at the top and the other at the bottom of the lift well. These schemes are probably the most reliable, but it is sometimes difficult to find space for the switches anywhere but on the machinery platform at the top of the lift. Fig. 4 indicates one solution to this problem. The switches are fitted with forks in place of the operating bar shown in Fig. 2. These forks are operated by balls on a wire rope running on pulleys at the top and bottom of the lift well. The rope is driven up and down by the lift cage and carries " ruffs " or " flags"

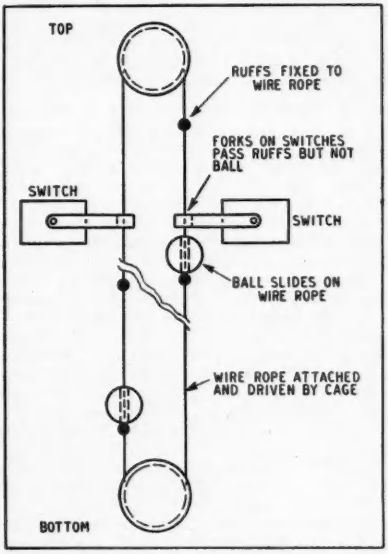


Fig. 4.—Alternative arrangement proposed

secured to the rope in the positions shown in the sketch. The forks on the switches will pass the " ruffs " but not the operating balls, which are free to slide on the wire between the " ruffs." The stages in operation are then as indicated in Fig. 3 except that the sliding ball performs the function of the sliding striker bar. The arrangement is less reliable to the extent that it involves wires in the lift well which move with the travel of the lift. A development of this idea is the use of the stout wire rope already provided in connection with one type of mechanical slack-wire device, to serve the purpose of the travelling wire shown in Fig. 4. One switch, with two forks, can also be used instead of the two switches shown in the diagram.

The fundamental feature of the improved arrangement is the striker or ball having limited movement in a direction parallel to the travel of the lift. It is this that enables the condition discussed under the heading of " The Nature of the Problem " to be satisfied. The principle has other applications and could be adapted to the mechanical limiting gear of machinery not driven or controlled by electricity. The Electrical and Engineering Branches of the Factory Department of the Ministry of Labour and National Service, which have examined an example of the device fitted to a lift, have expressed interest in it as a contribution to greater safety. Switches and mechanisms as described have proved entirely satisfactory on a goods lift operated by the Port of Bristol Authority at Avonmouth, and are to be fitted to a number of other lifts.

Lightning Protection

SURGES ON OVERHEAD LINES

THE protection of overhead power lines against lightning is dealt with in a paper prepared by Mr. H. M. Lacey (E.R.A.) for the Supply Section of the I.E.E.

The paper first summarizes available knowledge about surges and their propagation, the distribution of surge voltages in inductive apparatus and their effects on insulation, and gives information about protective devices.

Specific recommendations are then made for the best ways of using such information to protect different kinds of overhead lines and substations. Although the degree of protection to be afforded is predominantly an economic consideration, the author declares it to be wrong merely to offset estimated cost of possible damage against cost of protection. Industrial loss and inconvenience consequential to stoppage must be assessed in respect of each line.

An ordinary line crossing reasonably flat country where there is no special risk should have a single earth wire mounted well above the conductors. Vulnerable lines at heights appreciably above the general level need two earth wires, which should be bonded together at least at midspan; their height above the nearest conductor should be not less than twice the length of one of the suspension insulator strings and their horizontal spacing should equal the longest cross arm. A single earth wire is adequate only for vertically arranged conductors. In both cases there should be arcing rings or horns on individual insulators, the gap setting to be 80 per cent of the minimum air path over the insulator.

The length of line which is nearest to a substation that requires special protection should be at least one mile, or more if the importance of the substation justifies the additional cost entailed. Extra high towers and those in soil of high resistivity should be fitted with expulsion gaps as well as all adjacent towers up to the next nearest " normal " tower. The purpose of expulsion gaps is to interrupt follow-through current when flashover occurs and those on adjacent towers divert the resulting surge to earth at the earliest opportunity.

The recommendations apply mainly to lines of 33 kV and over mounted on steel towers, but most of them can be applied equally to wood-pole lines when economically justified. In the case of wood-pole lines there is a much stronger case for omitting earth wires if the earthing conditions are not satisfactory, except for one mile adjacent to substations. Protective air gaps on wood-pole lines of less than 33 kV can be divided into two parts and arranged on opposite sides of the insulator to minimize short-circuiting by birds.

Any vulnerable part of a substation itself will rarely receive a direct lightning stroke if there is in its vicinity an earthed metal structure or wire, the excess height of which (above the height of the vulnerable part) is greater than the horizontal distance between the two, providing there is proper earthing within the substation.

System insulation cannot be graded finely; steps must be few in number, say three (all line insulators, then bushings of transformers and switchgear and, finally, the inner parts of the latter) if excessive cost is to be avoided. A surge divertor should generally be installed at every substation, but any sort of protective gap near to, but not at, the substation must be avoided. The use of a short length of cable for surge modification can be effective if special precautions are taken. Alternative devices are the Ferranti surge absorber and the E.R.A. surge filter. The paper concludes with suggestions for further research.

New Cable Ship

LAUNCHED AT NEWCASTLE-UPON-TYNE

THE launching ceremony of the newest submarine cable repair ship was performed on 1st November by Lady Angwin, wife of the chairman of Cable & Wireless, Ltd., who named the vessel C.S. *Edward Wilshaw* after the governor of Cable & Wireless (Holding), Ltd.

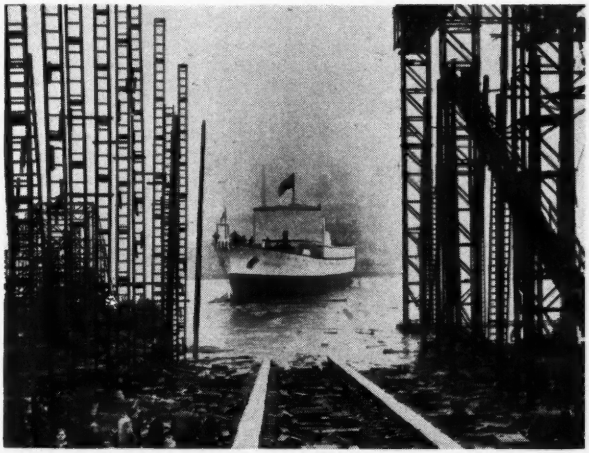
The ship has been built for Cable & Wireless, Ltd., at the Neptune yard at Walker of Swan, Hunter & Wigham Richardson, Ltd., being the twenty-first cable ship to be built at that Newcastle - upon - Tyne shipyard. She is to be commissioned next spring, is of 2,400 tons gross, 311 ft long overall with a beam of 41 ft and 19 ft mean draught. She will have a complement of 90 officers and men and be able to work in the maximum depth of water in which cables are laid. The operating range will be 10,000 miles and the cable-coiling capacity is 18,850 cu ft, which is equivalent to 400 miles of deep-sea cable.

The clipper stem carries three cable sheaves and two independent cable gears are fitted abreast on the main deck forward, to work at full steam pressure. The windlass engine is in a separate compartment on the main deck, the cable lifters on the upper deck being worked by vertical shafting from the engine below. There is a centre line capstan head on the upper deck forward and warping capstans to port and starboard at the after end with combined steam and hand steering gear on the main deck. The transportable turning-over gear for the submarine cable is by Johnson & Phillips, Ltd.

The cable test room apparatus is similar to that generally installed in the company's other cable ships, most of the high-precision instruments being of Sullivan, Gambrell & Muirhead manufacture. There are two separate echo depth sounding installations consisting of Marconi "Seagraph" and "Seavisa" sets for 0 to 600 fathoms and a type XX1.E Marine Instruments deep-sea sounder.

One "Metrovick" radar set is being installed by Siemens Bros. & Co., Ltd. The radiotelegraphy equipment is all of Marconi make, comprising a "Worldspan" transmitter, an "Electra" short wave and "Mercury" medium and long wave receivers with loudspeaker extensions into the test room; a direction finder coupled to the gyro-compass repeater mechanism, an auto-alarm device, a "Reliance" emergency transmitter and a portable lifeboat transmitter with receiver.

The Marconi sound reproducing system consists of a broadcast receiver with gramophone unit fitted in the ante-room to the officers' saloon with extension loudspeakers serving each mess. Three "walkie-talkie" sets are also being provided.



The c.s. *Edward Wilshaw* immediately after launching

The ship will be propelled by reciprocating engines fitted aft, the two triple-expansion sets together developing 2,100 i.h.p. at 130 r.p.m. for about 12·75 knots trial trip speed.

Steam will be generated by three multitubular 220 lb/sq in. Scotch boilers burning oil fuel with forced draught. All the auxiliary machinery is independently driven. There are four d.c. 110-V generating sets, three 40-kW sets being driven by Belliss & Morcom steam engines and the 35-kW emergency set by a McLaren Ricardo diesel engine; all four dynamos are of Campbell & Isherwood make, arranged for paralleling on the main switchboard. Pumps are of Drysdale make and the workshop machinery is all electrically driven.

Pyrotenax cable has been used for all main and sub-main circuits, also in the boiler room, galleys and holds; elsewhere it is 660-V grade

v.i.r. insulated, lead covered and braided. The main engine "Revometers" and an electric log are by the Improved Submerged Log Co. Telegraphs connecting the bridge with the engine room and ship's bows, also the rudder indicator, a 20-point intercommunicating telephone system and eight direct telephone lines are by Siemens Bros. & Co., Ltd., an electric sounding machine of the Lucas type by the Telegraph Construction & Maintenance Co., Ltd., and electric chronometers and clocks by Thomas Mercer, Ltd.

Heating and ventilating are on the single trunk system, there being four Thermotank ventilating units. Electrically driven J. & E. Hall methyl-chloride refrigerating plant serves the cold chambers and the refrigerator service cabinet in the galley is by L. Sterne & Co., Ltd.

Lady Angwin "christening" the ship, with Sir Stanley Angwin (centre) and Sir Edward Wilshaw looking on

A washing machine, hydro-extractor and irons in the laundry are by Thomas Bradford & Co., Ltd. There are eight "Seco" electric boat winches by Welin, McLaughlan Davits, Ltd.

Since placing the contract for the C.S. *Edward Wilshaw* the company has bought from the Admiralty two more ships which have been renamed C.S. *Electra*, now based in the West Indies, and C.S. *Retriever*, now on her way to Singapore for repair work in the Far East. Both these vessels were built in the Neptune yard as also was H.M.T.S. *Monarch* (described in the *Electrical Review* of 10th May, 1946, pp. 715-718) owned by the G.P.O., which is the largest submarine cable-laying ship in the world and has been extensively employed under charter by Cable & Wireless, Ltd.

More than 23,000 nautical miles of British submarine telegraph cable forming links in the 155,000-mile "via Imperial" network passed temporarily into enemy control. The Italians severed the Mediterranean cables west of Malta and the Japanese controlled the network from Batavia and Penang northward to Shanghai. Nine small ships were mainly responsible for maintenance throughout the war, at the end of which only five vessels were left wholly to the company for restoring its cable system to commercial service.

Power for Factories

Advantages of Public Supply

FACTORY power and steam requirements are commented on in a two-part paper that was presented to the Manchester Association of Engineers last week.

In the first part Mr. F. Buckingham says it ought not to be necessary for a new mill to have its own power producing plant. Individual motor drives, though more costly, have undoubted advantages and private steam generating plant working a normal 44-hour week cannot compete with purchased electricity. Coal consumption is rarely as low as 2·4 lb per kWh generated so it appears that transference of load from all private plant to the public mains would save a considerable amount of coal.

The author stresses the claim for private generation, when justified, of an asynchronous set driven by a steam engine in preference to a small turbine, which is less efficient; not to drive any particular portion of the factory, but delivering power into common mains so that surplus energy goes back into the public supply system. With coal costing £3 per ton and evaporating 8 lb of steam per 1 lb of coal, the cost of fuel should be 0·144d. per kWh generated in this way.

Control can be quite automatic, power being delivered to the mains in proportion to the demand for exhaust steam for factory processing. Overload is prevented by the limited capacity of the engine cylinders for steam when running at a sensibly constant speed. Phase swinging is impossible when operating in parallel; there is no synchronizing or need to control voltage or frequency. Wattless current is taken from the mains, as with any ordinary induction motor, but a condenser can be used to correct the power factor.

An asynchronous alternator is cheaper to install than a synchronous machine and an ordinary motor can be adapted to the purpose. It is normally excited from the external mains to which it is connected and, therefore, cannot function independently. It may be of the squirrel cage or wound rotor type; if of the latter kind, d.c. for magnetizing can be supplied to the slip rings from a separate or shaft-driven exciter to enable the alternator to work independently.

In the second part of the paper Mr. C. G. Huntley shows with the aid of several examples that there is no merit in producing power economically if it is incorrectly utilized so that processing steam is wasted.

Views on the News

By REFLECTOR

ECHOES of the private *versus* public control of electricity issue were heard in *The Times* last week. Mr. E. C. Mekie (Edmundsons Electricity Corporation) questioned whether the British Electricity Authority fully appreciated the serious nature of the shortage of power plant and whether it was doing all that it might to alleviate the shortage. He quoted as an example of what private enterprise could do the erection of a capital station in nineteen months during the war.

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Mr. Mekie's letter drew a reply from Mr. L. J. Luffingham, public relations officer of the B.E.A., who contended that the Authority was more than apprehensive of the position and through its chairman was constantly drawing the attention of the Government to the dangers threatening the country through lack of electricity. The rapid erection of the Llynfi station, Mr. Luffingham hinted, was not typical; three to three and a half years was generally accepted as the period required for the construction of a large modern station. He also pointed out that not one but 25 new stations, apart from 50 to 60 major extensions, were in hand at the present time. The question raised by the correspondence seems to me to be whether power station construction should be intensive (rapid erection of stations one by one by "shock tactics") or extensive, giving total relief at the end of an extended period.

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Though available in this country for several years electric radiators and plate warmers constructed of armourplate glass, with the heating elements applied on the surface usually in the form of a pattern, have never "caught on" to any great extent. I see now, however, that in America a firm of manufacturers is launching a big campaign for popularizing this type of heater, elements in this case taking the form of aluminium alloy ribbons fused on to the glass. Besides fixed and portable radiators and serving trays, a new application is offered in the shape of a clothes dryer, two glass heating panels 16 in. by 24 in. with a loading of 1,200 W fitted in the base of a metal cabinet maintaining the temperature at a maximum of 190 deg F. The manufacturers claim that the panels costing $45 each, could be installed permanently in the walls of new homes for a much as $1,000 less than any other type of home heating system, would last fifty years and never need servicing. About 8,000 kWh would be required annually to heat an average six-room house.

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I was somewhat amused to see the faces of public clocks in Birmingham partly suffused by blushes. Segments of their dials have been painted red to indicate to the public the hours during which they must try to "keep off the peak." Mr. W. A. Gazard in the November *Electrical Contractor* uggests that people looking at a public clock aren't using electricity; maybe it reminds housewives out shopping that they have left the cooker on at home. Perhaps a more effective method would be to send round men to paint domestic clocks; the public may eventually become docile enough to permit it.

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Alison Settle in last Sunday's *Observer* says that "rival advocates of the merits of gas and electricity have been waiting with interest to know which service would mainly be used in Princess Elizabeth's future home, Clarence House." Although the writer says that "a just balance has been kept," it seems that gas is preponderant. Most of the cooking and water-heating is to be done by gas equipment, but there is an electric cooker and an electric hot-closet in the pantry and the refrigerators are also electric.

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For those who like delving in statistics there is a wealth of information in the volume published each year by the Brisbane City Council which to-day functions as a unified administration covering the activities of twenty former councils and a number of joint boards, including such utilities as tramways and electricity. The section dealing with the progress of the electricity department includes a table which shows that between 1927 and 1947 the number of kWh sold increased from just over 9 million to 122 million. The average number of kWh sold per consumer in 1946-47 was 1,622 and the average kW connected per consumer 4·3. Maintenance cost averaged 19·8s. per service.

Pilot-Wire Protection

Method of Testing

By S. A. DAINES, A.M.I.E.E.

THE balanced-voltage principle for plain feeder protection is being applied to a larger extent on main feeders from power stations to major substations or between such substations. Very often, by the time the switchgear is installed, the cabling jointed and the protective gear wired, little time remains for making extensive tests. The testing engineer should, therefore, plan ahead the minimum number of tests he should carry out to ensure complete confidence in the reliability of the protective system, once the feeder is put into service.

A diagram of connections for one such system is shown in Fig. 1. Such an interconnection of current transformers, summation and relay transformers, pilot wires and relays at opposite ends of a feeder, fully justifies a thorough check of continuity, polarities, stability and efficacy of relay settings. Such checks can be made separately on component parts of the equipment, but the ideal method is that which most nearly approaches load conditions, i.e., primary injection by phantom load on the complete gear.

The method of obtaining the test current having been chosen from the available apparatus and source of supply the procedure is as follows:—

(1) (a) Measure the insulation resistance of pilot cables, between poles and to earth;

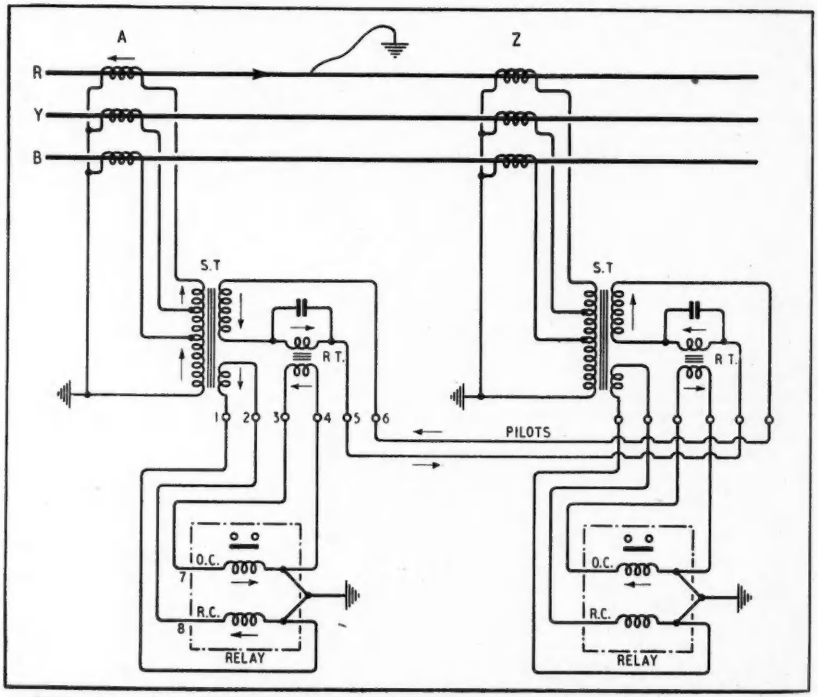


Fig. 1.—Connections of balanced-voltage protective gear, without trip circuits, showing effect of earth fault on red phase. S.T., summation transformer; R.T., relay transformer; O.C., operating coil; R.C., restraining coil

(b) measure ohmic resistance of pilot-cable loop (for future reference); (c) identify pilot-cable cores with supposedly correct pilot-cable terminals; (d) check insulation resistance of general protective equipment at each end of feeder. This proves the general suitability of equipment for proceeding with detailed tests.

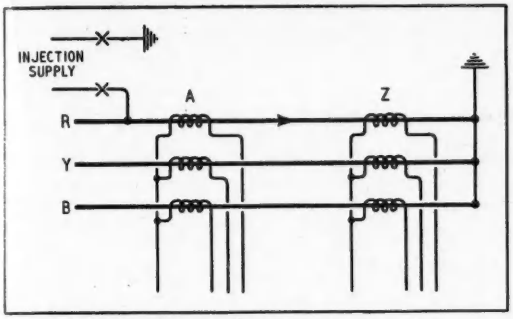


Fig. 2.—Checking relay-transformer characteristics

(2) Connect a high-impedance voltmeter (100-V) to terminals 5 and 6, temporarily disconnecting the two pilot cables. Pass 50 per cent or more of normal full load along the red phase from A to Z, the latter end being earthed as shown in Fig. 2. Repeat with Y and B phases, measuring the pilot terminal voltage in each case. Also measure the current in the secondary of each current transformer. This proves the secondary output and ratio of each current transformer and its connections; the summation-transformer primary and its phase portion of secondary and the relay-transformer primary and connections to pilot terminals.

(3) Balance. Reconnect pilot cables for assumed correct operation. Again pass test current via R phase from A to Z, measuring mA in the compensating-coil circuit (2-8) and mA in the operating coil circuit (3-7). Repeat with Y and B phases in turn. This proves the compensating-coil and operating-coil circuits (with the restraining and out-of-balance features connected with each) and the "earth" portion of summation-transformer secondary. Non-operation of the relay in this test, with the relay setting low, *suggests* that pilot and current transformer polarities are correct.

(4) Transpose the connections of pilot cables at terminals 5 and 6 and pass test current through each phase as before. If the relays operate on each phase then the polarities of pilot cable connections and c.t's were previously correct. Even if there were no out-of-balance current in test No. 3, the circuits are nevertheless proved correct. The connections to terminals 5 and 6 are then corrected.

(5) Fault settings. As in Fig. 3 the secondary of the c.t's at the remote end of the feeder are disconnected and short-circuited while the single-phase current is again passed along the primary cable of each phase in turn. In this case the test current is gradually increased each time so that a milliammeter in the operating-coil circuit (3-7) can be read at the instant the relay operates and the oil circuit-breaker trips. This proves the calibration of the relay by checking the primary current necessary to trip the circuit-breaker at that particular setting on the relay (equivalent to an earth fault on each phase).

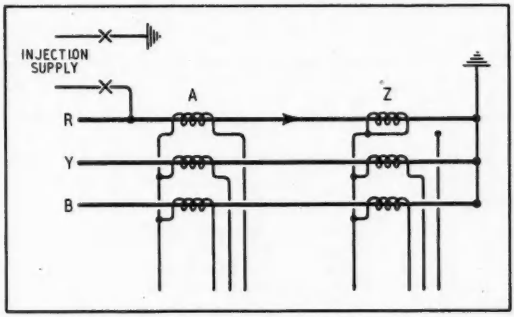


Fig. 3.—Checking protective gear for fault settings

The injection equipment is then left at substation A which should be in telephonic communication with substation Z, at which site most of the foregoing tests are repeated.

Such a series of tests can be completed in a few hours if the preliminary work of

providing the apparatus necessary for applying the injection current is carried out efficiently; when the tests are completed every confidence can be placed in the equipment to fulfil its proper function.

It is not essential for the c.t. ratio test to be taken at substation Z, nor need the tripping by pilot-cable connection transposition be repeated. Further, with duplicate voltmeters, four milliammeters and extra testing staff, tests No. 2 and 3 can be made simultaneously at both ends of the feeder with consequent time saving. Results can be tabulated as shown below:—

GENERAL

Current-transformer ratio (all phases) = amps
Pilots. Resistance of loop = ohms
Insulation resistance between poles = megs: to earth = megs
Identification S/S(A) No. 26 = s/s(Z) No. 71
" " No. 27 = " No. 72
Insulation resistance of general equipment S/S(A) =
" " " " " S/S(Z) =

PILOT VOLTAGE

Site	Feeder	Primary current, amps			P.D. across pilot terminals, Volts	Remarks
		R	Y	B		
Substation A	AYZ	—	—	—		Pilot cables disconnected
		—	—	—		
Substation Z	ZYA	—	—	—		
		—	—	—		" " "

(Pilot cables reconnected)

BALANCE

Site	Feeder	Primary current, amps			Relay comp. coil current, mA	Relay operating coil current, mA	Remarks
		R	Y	B			
Substation A	AYZ	—	—	—			Single-phase current passed through two sets of equipment (one each end of feeder)
		—	—	—			
Substation Z	ZYA	—	—	—			Ditto
		—	—	—			

At Substation A
Pilot cables transposed, single-phase current passed through each phase in turn, oil circuit-breakers tripped at both ends of feeder.

At Substation Z
Ditto
(Pilot cables restored to normal)

FAULT SETTINGS

Site	Feeder	Primary current, amps			Relay setting	Relay operating coil current, mA	Remarks
		R	Y	B			
Substation A	AYZ	—	—	—	m.a.		Red c.t. S/S at Z. o.c. b's tripped
		—	—	—	m.a.		Yellow " " " " "
					m.a.		Blue " " " " "
Substation Z	ZYA	—	—	—	m.a.		Red c.t. S/S at A " " "
		—	—	—	m.a.		Yellow " " " " "
					m.a.		Blue " " " " "

If, as is usual, in this last test the relay at the distant substation trips slightly prematurely, its setting should be temporarily raised so that a true tripping value for the relay at the local substation can be verified.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Eastern Electricity Board announces that managers of the seven districts to be set up in the Suffolk Sub-Area have been appointed as follows:—Woodbridge: **Mr. A. Wade** (formerly engineer and manager, East Suffolk Electricity Distribution Co., Ltd.); Diss: **Mr. J. H. Shepherd,** A.M.I.E.E. (formerly borough electrical engineer, Harwich Corporation); Bury St. Edmunds: **Mr. F. A. Moinet,** A.M.I.E.E. (formerly resident manager, Bury St. Edmunds, East Anglian Electric Supply Co., Ltd.); Stowmarket: **Mr. G. N. H. Mayes,** T.D., A.M.I.E.E. (formerly resident manager, Stowmarket, East Anglian Electric Supply Co., Ltd.); Clacton: **Mr. S. N. Boyne,** A.M.I.E.E. (formerly electrical engineer and manager, Clacton U.D.C.); Colchester: **Mr. G. P. Dixon,** A.M.I.Mech.E. (formerly borough electrical engineer, Colchester Corporation); Ipswich: **Mr. R. A. Jackson,** A.M.I.E.E., A.M.I.I.A. (formerly deputy chief electrical engineer, Ipswich Corporation).

Mr. D. T. A. Townend, D.SC., PH.D., D.I.C., HON.M.INST.GAS E., was installed as president of the Institute of Fuel at a recent meeting of the London Section of the Institute. Dr. Townend, who succeeds **Dr. C. H. Lander,** C.B.E., was called in 1938 to the Livesey Professorship in the University of Leeds in succession to Prof. J. W. Cobb. In 1946 he was appointed Director of the British Coal Utilisation Research Association and in 1947 became Director-General.

Sir George Usher, chairman of Aberdare Cables, Ltd., and Aberdare Cables, South Africa, and managing director of International Combustion, Ltd., and International Combustion S.A. (Pty.), Ltd., left this country on 4th November for an extended business visit to the Union and the Rhodesias.

Mr. W. A. McNeill, B.SC.TECH., M.I.E.E., has been appointed chief switchgear engineer of the Brush Electrical Engineering Co., Ltd. He commenced his duties on 1st November. Mr. McNeill received his education at Manchester Grammar School and at Manchester University, and served apprenticeships with the Metropolitan-Vickers Electrical Co., Ltd., and with Ferguson, Pailin, Ltd. In 1942 he was appointed chief electrical research engineer to the latter company, and has been engaged on the development and testing of a wide range of h.v. switchgear. Mr. McNeill has served on a number of B.S.I., B.E.A.M.A. and E.R.A. committees and has also taken an active part in the work of the North Western Centre of the Institution of Electrical Engineers.

Mr. W. A. McNeill

The Midlands Electricity Board has made a number of new appointments. **Mr. G. F. Peirson,** M.I.E.E., M.AMER.I.E.E., becomes chief engineer in succession to Mr. D. P. Sayers, recently appointed deputy chief engineer (transmission) of the British Electricity Authority. Mr. Peirson was formerly sub-area manager of the Board's South Staffs and North Worcs Sub-Area, and before vesting date was chief engineer of the Midland Electric Corporation for Power Distribution, Ltd., and a member of the West Midlands J.E.A. Mr. Peirson is succeeded as sub-area manager, South Staffs and North Worcs, by **Mr. T. G. Keeler,** M.I.E.E., formerly deputy sub-area manager.

Mr. G. F. Peirson

Mr. R. Mallet, B.A., M.I.E.E., has been appointed chief assistant engineer at the headquarters of the Board, Halesowen. Previously he was section head, planning and development, in the Engineering Department at the Board's headquarters.

Mr. W. R. Baker, A.M.I.E.E., has been appointed section head, contracting, in the commercial department at the Board's headquarters. Before vesting date he was contracts engineer with the S.W. & S. Electric Power Co.

R. W. Gregory & Partners, consulting engineers, have taken into partnership **Mr. F. E. Heppenstall,** B.SC., A.C.G.I., A.M.I.E.E., as from 1st November. Mr. Heppenstall was lately with the North Eastern Electricity Board and formerly with the Newcastle & District Electric Lighting Co., Ltd. The name of the firm will remain unchanged.

Mr. W. M. Little, B.SC., A.M.INST.C.E., A.M.I.E.E. who has been acting transport manager for Edinburgh Corporation since the death of Mr. Robert McLeod two months ago, has been appointed to the vacant office.

About 300 people attended the autumn dance of the London Students' Section of the **Institution of Electrical Engineers** held in the North Hall Suite of the Victoria Halls, Bloomsbury Square. Among the guests were Mr. T. G. N. Haldane, president of the Institution, and Mrs. Haldane, Mr. W. K. Brasher, secretary of the I.E.E., and Mrs. Brasher, and Mr. Briggs, Council's representative on the Students' Committee. Mrs.

Haldane presented the prizes to the spot dance winners and she in turn was presented, on behalf of the Section, with a bouquet. Music was provided by Chris Stone's Orchestra.

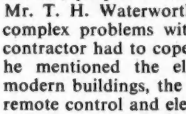
The annual dinner and ball of the London Branch of the **Electrical Contractors' Association,** which was held last week at Grosvenor House, Park Lane, W.1, was essentially a ladies' night, and in deference to the ladies, therefore, the speeches were of the briefest.

In reply to the toast of the chairman and members of the London Branch, proposed by Mr. R. E. Bristow, the chairman, Mr. S. L. M. Barlow, referred to the nationalization of the supply industry and said that the electrical contractors represented private enterprise at a most difficult time. The Association was negotiating agreements vital to electrical contractors and he therefore urged them to rally to its support.

Mr. V. J. Stock, vice-chairman of the London Branch, proposed the toast of the guests and Mr. T. H. Waterworth, in reply, spoke of the complex problems with which the present-day contractor had to cope, and illustrative of these he mentioned the electrical requirements of modern buildings, the problems of distribution, remote control and electronics.

Following the dinner, the gathering of 300 or more danced until the early hours, with a break during the evening for an excellent cabaret.

Prof. P. M. S. Blackett, M.A., F.R.S., has been awarded the Nobel Prize for Physics for his work on cosmic radiations. Professor Blackett, who is Langworthy Professor of Physics at the University of Manchester, is widely known for his work on nuclear physics and cosmic rays. During the war he worked for the Admiralty and in 1940 he was elected president of the Association of Scientific Workers. When the Government appointed an Advisory Committee in 1945 to assist it in dealing with questions raised by the discovery of atomic energy, Prof. Blackett was appointed a member of that Committee.



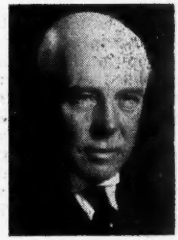
Prof. P. M. S. Blackett

Mr. L. R. Lipkin has been appointed a director of S. Guiterman & Co., Ltd., as from 1st November.

Obituary

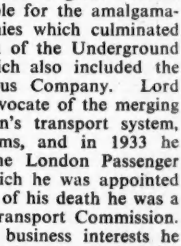
Mr. M. W. Ashby.—The death occurred suddenly on 24th October, at his home, Great Hallingbury, near Bishop's Stortford, Essex, of Mr. Marcus W. Ashby, who was a director of the Woking Electric Supply Co., Ltd., for forty-five years, and chairman of the company for twenty-eight years.

Lord Ashfield.—The death occurred on 4th November, in his seventy-fourth year, of Lord Ashfield whose name will always be associated with the development and progress of the London transport system, and in particular with the London underground railways. He was born in Derbyshire, but went to Canada with his parents as a boy. In 1906 he was appointed managing director of J. G. White & Co., of New York, a financial and contracting firm, and in 1907 he became general manager of the Underground Electric Railways Co. of London, Ltd. As general manager of this company he embarked on a programme of expansion and development at a time when the finances of the underground system were poor, and his programme proved a great success. He was largely responsible for the amalgamations with other companies which culminated in 1912 in the formation of the Underground group of companies, which also included the London General Omnibus Company. Lord Ashfield was a strong advocate of the merging of the whole of London's transport system, including buses and trams, and in 1933 he saw the formation of the London Passenger Transport Board of which he was appointed chairman. At the time of his death he was a member of the British Transport Commission. Among his many other business interests he was chairman and managing director of the Northmet Power Co. Lord Ashfield was knighted in 1914 and was created a baron in 1920 in recognition of his war services.



The late Lord Ashfield

Mr. J. E. Kingsbury.—The telephone industry has lost one of its few remaining pioneers by the death of Mr. John E. Kingsbury, M.I.E.E., which occurred on 4th November at the age of ninety-three. Mr. Kingsbury's practical interest in telephony commenced in 1878 and commercially in 1883, when he started the British branch of the Western Electric Co., Ltd., of which he was general manager until 1910, and during his managership he was responsible for the construction of the Woolwich works. In the last-mentioned year he retired from active management, although he remained a member of the board of the company for some years after. Later he joined the



The late Mr. J. E. Kingsbury

boards of a number of telephone companies engaged in the operating field. In 1910 he became a director on its inception of the Damard Lacquer Co., Ltd., the predecessor of Bakelite, Ltd., and later became vice-chairman of the latter company. He was hon. treasurer of the Institution of Electrical Engineers from 1915 to 1919, a member of Council from 1900 to 1903, 1906-09 and 1911-14; and vice-president from 1903 to 1905. Mr. Kingsbury was the author of many papers and publications on telephony, and his book on "The Telephone and Telephone Exchanges," published in 1915, became a standard work of reference.

Among those present at the funeral on Tuesday were Sir Frank Gill, representing the I.E.E.; Sir James Swinburne, late chairman of Bakelite, Ltd., Mr. H. V. Porter, present chairman of Bakelite; Col. Behn, of the International Telegraph & Telephone Corporation; and General W. H. Harrison, of the International Standard Electric Corporation.

Mr. W. B. R. Mumford.—The death has occurred in New Zealand of Mr. W. B. R. Mumford, M.B.E., M.I.E.E., who was acting as manager for A. Reyrolle and Co., Ltd., during the absence on leave in England of Mr. W. A. Simpson. Mr. Mumford who was 38 years of age, was educated at Blundell's School and at Faraday House and received his practical training with Fielding & Platt, Ltd., Gloucester and with the Cie Générale Electrique, Nancy, France. He joined A. Reyrolle & Co., Ltd., in 1931 and became a contracts engineer, dealing particularly with overseas work. In 1936 he was appointed an overseas representative in India and after his return ultimately became liaison officer with the C.E.B. in Leeds. Later he went back to India, joined the Royal Engineers there in 1941 and served on the headquarters staff, attaining the rank of lieutenant colonel.

The late Mr. W. B. R. Mumford

After the war he returned to Reyrolles and visited America and Sweden for the company. He went to New Zealand at the end of last year.

Mr. H. H. Baker.—The death occurred on 2nd November of Mr. Herbert Henry Baker, M.I.MECH.E., who was one of a group of able young men whom the late Charles Merz gathered round him at the turn of the century when he was putting into practice on the North-East Coast his far-seeing ideas for making electricity available over wide areas and concentrating generation on the most economic sites. Mr. Baker was born at Tamworth in 1877 and after training with Bagnalls of Stafford and with Ferranti and Siemen's he joined Merz as his chief draughtsman in 1902, subsequently taking charge of all steam and mechanical work. In 1927 Merz and his partner William McLellan invited Mr. Baker to join them and he remained a partner until ill-health compelled him to retire in 1942. Among the power stations with which Mr. Baker was closely concerned were Carville, Dunston, North Tees, Lots Road and Barking, but there were many others in this country, Australia, Argentina, South Africa and India and important pioneer installations in Chicago. The well-known travelling coal chute on stokers was one of his ideas and he took a leading part in the development of higher steam pressures and temperatures.

Mr. Henry Bevan Smith, A.M.I.E.E., a past president of the Radio Society of Great Britain, died on 3rd November at the age of seventy-four.

I.E.E. Liverpool Dinner

Tribute to Educational Scheme

THE annual dinner of the Mersey and North Wales Centre of the Institution of Electrical Engineers was held at Liverpool on Monday last, the Centre chairman, Mr. T. B. D. Terroni, presiding.

Mr. A. S. Magnay, Director of Education, Liverpool, commended the Institution's educational scheme which, he said, went to the heart of the problem, ensuring for entrants to the profession the broadest basis of general culture and scientific study before specializing. There was a great need for technical administrators with the broadest outlook. He advocated the return of students from works to college for further study, and greater co-operation between education and industry in teaching. He thanked the Automatic Telephone Manufacturing Co. for its gifts to the University.

The president, Mr. T. G. N. Haldane, stated his belief that engineering education could be combined with knowledge of the "humanities" as a corrective to early specialization. Referring to the Institution's educational scheme, Mr. Haldane said that the broadest foundations were necessary to meet continually changing techniques. Our stability was admired by foreign engineers. This stability was attributable to sport, a democratic form of government, and to independent organizations such as the Institution, which balanced central and local control and specialized interests.

Mr. J. Eccles referred to the presence of several distinguished guests and paid tribute to the technical Press which he regarded as a valuable part of industry. Alderman W. Gregson, Deputy Lord Mayor, replied for the guests.

Mr. P. C. Barnes wished the chairman a successful year of office, and Mr. Terroni briefly responded, mentioning the assistance given him by Mr. Milton, hon. secretary, and Mr. Taylor, hon. treasurer.

Industry and the House

Criticisms of the B.E.A.

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

THE new Session of Parliament was opened by the King and Queen on 26th October with full pre-war splendour. The King's Speech outlined many non-controversial legislative matters and there was no direct reference to matters affecting the electrical industry. The King did, however, announce the Government's intention to introduce a Bill to " bring under public ownership those companies extensively engaged in the production of iron ore, or of pig iron or steel, or in the shaping of steel by a rolling process." He also announced that the Parliament Bill would be reintroduced. This measure, designed to curtail the powers of the House of Lords, is deemed necessary by the Government to ensure that the Upper House cannot delay the passage of the Iron and Steel Bill beyond the presumed date of the next General Election.

The latter part of the debate on the Address was concerned with the state of the nationalized industries. The British Electricity Authority was criticized by Mr. Hudson in his opening speech on behalf of the Opposition. He admitted that it would be unfair to ask for full details of the results of nationalizing electricity, because it had only taken place recently. He maintained that all the inevitable difficulties of nationalization were already making themselves felt. There was the usual proliferation of committees; one employee who used to get quick decisions under private enterprise was, according to his informant, now having to submit ninety copies of his proposals to the members of the various committees by whom his proposals would have to be considered before a decision was made.

Electricity Charges

Mr. Gaitskell in his reply on the following day made a spirited defence of the Authority. He admitted that electricity charges had gone up since the vesting date, but explained this on the grounds that no fewer than 150 undertakings were incurring losses at the vesting date. He reminded the House that the Electricity Commissioners during the war had discouraged increases in electricity charges because the Government wished to keep down the cost of living, even if it meant, as it did in some cases, that reserves were eaten into. Such a situation could not continue and " whether or not nationalization had taken place, these losses would have had to occur."

Mr. Gaitskell went on to explain that these increases were not in themselves sufficient for the industry as a whole and consequently a further increase in some cases had to be agreed. Thus the B.E.A. in consultation with the Area Board chairmen settled on a minimum running charge of ¾d. per kWh for most of the two-part non-industrial tariffs.

The Minister of Fuel and Power also disposed of the rumours which have been circulating that a large number of generating sets are in store. He said that there was no truth in the story, but there might be one or two waiting for erection on individual sites. " It would be very surprising, in the construction of a power station which takes three and a half years to complete, if every single piece arrived on time to be fitted in at the exact moment. That for a few weeks some bit of plant should be in store until the other parts are ready is a perfectly natural thing."

Progress Payments to Contractors

Several Opposition M.P.'s are far from satisfied with the methods which the B.E.A. is adopting in connection with its generation station programme. Some quite unnecessary delays are occurring in the offices of the Authority or the Area Boards. For example, progress payments to contractors, although approved by consulting engineers or the appropriate body, are being held up while independent measuring up is carried out by the Authority's own staff, although it is agreed that the amount certified is well within the total amount of work done. In another case a firm in the Midlands was seriously embarrassed financially after completion of a contract because the Authority withheld payment for the whole of the work done while a detailed item was being argued out.

A North Country M.P. reports a case where the Authority asked four main contractors to submit tenders for the construction of a new generating station within five weeks

as a matter of special urgency. With some difficulty the contractors managed to submit tenders within this time limit. Now, two and a half months later, the Authority has still not decided which contractor is to have the work, and all four contractors are having to keep plant standing by, which could be used elsewhere.

Mr. J. A. Boyd-Carpenter (Kingston-upon-Thames) has been rightly indignant at the suggestion contained in press hand-outs that the new Kingston power station was "the first of twenty-five planned by the British Electricity Authority." In a letter to *The Times* he pointed out that all the planning and most of the construction of the station had been carried out by the Kingston Corporation and the Central Electricity Board before the B.E.A. came into being.

Members are becoming increasingly concerned with the progress of the Government's free hearing aid scheme. At Question Time they have been pressing for the Government to grant free batteries for persons at present using commercial hearing aids purchased before the national health scheme came into operation.

Mr. Bevan said that it would be difficult administratively to provide the variety of batteries required in the private sets. There is some danger that private sets may be discarded and Government aids acquired in order to obtain free batteries, and thus throw unnecessary expenditure on the taxpayer.

In answer to other questions, the Minister once again refused to consider making grants to deaf persons who purchased commercial aids more suited to their needs than the standard "Medresco" device.

PARLIAMENTARY NEWS

By Our Special Reporter

DURING the debate in the House of Commons on the Address in reply to the King's Speech, the control and working of the nationalized industries was strongly criticised by Opposition speakers. Mr. Gaitskell defended nationalization and replied specifically to complaints about electricity charges. The facts were that at the vesting date no fewer than 150 undertakings were making losses. The total of these losses amounted at that time to between £5,000,000 and £7,000,000 a year. This phenomenon was partly the result of deliberate Government policy during the war, whereby the Electricity Commissioners were encouraged to refuse increases in electricity charges submitted to them by municipalities, because the Government wished to keep down the cost of living. Indeed, the Commissioners went so far as to insist that municipalities should eat into their reserves, even if they were making losses, before the Commissioners would agree to increased charges.

Obviously, that situation could not continue. Nothing had been done about it before, for the simple reason that in many cases the municipalities were somewhat indifferent towards the financial future of their undertakings, because they knew that they were going to be nationalized. In many cases applications to the Commissioners had actually been made before the vesting date. Therefore, the British Electricity Authority, as soon as it took over, had immediately to apply first-aid measures and raise the tariffs in these 150 cases. It could have done nothing else. It was perfectly obvious, whether or not nationalization had taken place, that these increases would have had to occur.

Secondly, it was found, when a further survey was made of the financial position, that these increases were not sufficient for the industry as a whole, and that there were other undertakings which, because of increases in costs, all of which occurred before nationalization, were themselves in financial difficulty. Consequently, a further increase in some cases had to be agreed. What the British Electricity Authority did, in consultation with the area board chairmen, was to settle on a minimum running charge of ¾d. per kWh for most of the two-part non-industrial tariffs. The reasons for this increase were: the Government policy during the war of keeping down charges; the wage increases granted in January and February, 1948, before the vesting date, and the increase in coal prices in September, 1947, and January, 1948.

Finally, the change in tariffs due to the differential which was being introduced between the winter and summer rates. That, of course, was closely related and entirely connected with the peak load. Taking the year as a whole, the consumer should pay no more. It was simply an increase in the form of the tariff. It had been introduced because of the great difficulty of adopting any system of rationing; it had absolutely nothing to do with the nationalization of electricity.

With regard to the generating position, Mr. Gaitskell said that there was absolutely no truth in the story that there were vast quantities of turbo-alternators lying about in store. There might be one or two, but that was inevitable in a programme of that kind. It would be very surprising, in the construction of a power station which took 3½ years to complete, if

every single piece arrived on time to be fitted in at the exact moment. That for a few weeks some bit of plant should be in store until the other parts were ready was a perfectly natural thing.

Railway Electrification

In the House of Lords debate, Lord Monkswell, dealing with railway nationalization, earnestly hoped that no electrification of surface lines would be undertaken without making quite sure that it would be financially justifiable. There was an enormous propaganda in favour of electrification, but the really important consideration, whether electrification saved money in comparison with the service given by the best type of steam locomotive, was wrapped in mystery.

Consultative Councils

Replying to a question by Mr. C. Taylor, Mr. Gaitskell said that the following bodies had been asked to submit nominations for the Consultative Councils to be set up in England and Wales:—

(i) *Under Section* 7 (2) (*a*) *of the Electricity Act*, 1947: County Councils Association, Association of Municipal Corporations, Urban District Councils Association, Rural District Councils Association, London County Council, City of London Corporation, and the Metropolitan Boroughs Standing Joint Committee. (ii) *Under Section* 7 (2) (*b*) *of the Electricity Act*, 1947: Federation of British Industries, National Union of Manufacturers, Association of British Chambers of Commerce, Parliamentary Committee of the Co-operative Congress, Trade Union Congress, Ministry of Agriculture and Fisheries (covering National Farmers' Union, Central Landowners' Association, National Union of Agricultural Workers, Transport and General Workers' Union (Agricultural Section), Institution of Electrical Engineers, Electrical Association of Women, National Council of Women for Great Britain, National Federation of Women's Institutes, Women's Voluntary Services, and the Standing Joint Committee of Working Women's Organizations. With regard to the two Consultative Councils to be set up in South East and South West Scotland, corresponding Scottish bodies had submitted nominations.

Wireless Telegraph Bill

Mr. Oliver Lyttelton, Mr. Robert Grimston, Sir Arnold Gridley, Mr. William Shepherd and Mr. F. J. Erroll, for the Opposition, have tabled a motion for the rejection of the Wireless Telegraph Bill on the grounds that it contains onerous provisions that cannot be justified by public need; that it enables the Postmaster-General to compel citizens to incur expenses as a condition of using apparatus lawfully manufactured and acquired; and that it confers on the Government further powers to invade the privacy of the house.

Non-Magnetic Cast Iron

DURING last month occurred the twenty-fifth anniversary of the granting of a patent to S. E. Dawson, manager and chief metallurgist of the Ferranti foundry, for "machinable and practically non-magnetic alloy cast iron of higher specific resistance than ordinary cast iron and having as its essential constituents grey cast iron, manganese and nickel," which was termed "Nomag."

Manganese had previously been used to produce non-magnetic ferrous alloys, but these were practically unmachinable, whereas in Dawson's alloy the addition of nickel and the reduction in the proportion of manganese to ordinary grey cast iron produced a material of desirable electrical characteristics with virtually unimpaired machining properties.

This alloy combines a specific resistance 50 per cent higher than that of cast iron with a magnetic permeability of 1·03, making it particularly suitable for electrical castings where eddy-current losses in ordinary grey iron would be prohibitive. It has also been used for resistance grids, in which high resistance properties are of more importance than permeability, as in the control of traction and crane motors. In this application its advantages are a reduction in size with more robust construction and better air circulation and in addition a resistance-temperature coefficient less than half that of grey cast iron, with doubled impact strength.

I.E.E. Students' Tour

AN account, illustrated with lantern slides and photographs, of the I.E.E. Students' Sections' tour in Switzerland, was given last week at London headquarters by four of those who took part.

Mr. D. R. A. Mellis, hon. secretary of the London Students' Section, gave a general account of the tour, describing in detail visits to light engineering firms. He mentioned the various services run by the post office, including wireless programmes available on the telephone and an extensive motor-bus service.

Mr. R. Burrows gave an interesting talk on Swiss railways, which are almost entirely electrified on the overhead line collector system.

Electricity generation on the hydro-electric side was dealt with by Mr. A. R. Thomson, who described one example of the storage tank system, which is widely used. New schemes are under construction and provision is being made for transmission at 380 kV in the future. Mr. E. A. Peacop used diagrams and sketches to explain the working of the gas-turbine power station at Beznau.

The editor of the *Students' Quarterly Journal*, Mr. J. H. Reyner, concluded the discussion that followed with reminiscences of the first Swiss Tour in 1925.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Fine-Gauge Copper Wires

WITH the good news that some of the war-time controls are to be lifted, I am writing to express the hope that the Ministry of Supply may see its way clear to lift the ban on fine-gauge copper wires. I have in mind the return of our old 35/40 and 70/40 flexibles. I understand that these were withdrawn owing to the huge demands for fine copper wires by the Services.

The substitutes given us in a lesser number of strands of 30 and 36 s.w.g. such as 6/·012 and 14/·0076 have been far from satisfactory owing to the quick fracturing of the less flexible strands, resulting in a heavy increase in the maintenance costs of portable tools, wandering and extension leads. The fine c.t.s. flexible made for vacuum cleaners has also been sadly missed together with that l.v. cable used on cars for wiring up to controls via the steering column and for distributor and coil l.v. connections.

Surely the splendid c.t.s. insulation the cable people give us to-day is worthy of enclosing a more reliable "heart."

Yeovil. C. J. BENNETT,
Chartered Electrical Engineer.

Teleprinter Installation

A RECENT experience of ours discloses a matter of interest on nationalized service with particular regard to the teleprinter service. When recently re-wiring the premises of clients, we provided a 2-A three-pin switch-plug for the teleprinter. Two months later the teleprinter service telephoned us saying that they require a 5-A three-pin plug. On asking why, and what was the loading of the teleprinter, we were first told that this was none of our business, but that we should provide the equipment required by H.M. Government.

On our assuring them that it certainly was our business, they conceded the fact that we could use either a 3-A or a 5-A plug. Our observation that no such thing as a 3-A plug existed led the Service back to the requirement of a 5-A plug.

Further telephone calls with higher authorities on this fundamental problem disclosed that the teleprinter had a current surge of 2-A and ran at something less than ½ A; nevertheless, the regulations require a subscriber to install a 5-A plug, and nothing could be done about it.

Since the earth pin on the plug which had been provided had been ignored by the engineers installing the teleprinter, this point was also raised, and we strongly advised the engineers concerned to have their motor earthed for the safety of their operatives, since our clients would accept no responsibility for any accident which might otherwise arise. The engineers agreed that a 2-A plug was quite adequate, but that "theirs was not to reason why. . . ."

It seems to us that not only is this an example of State machinery which we hope we shall not see in the electrical industry, but also all the teleprinters in operation are running at ½-A load, protected (?) with a fuse ten times the size of the running current. Some investigation and adjustment seems to be called for.

MORTIMER, GALL & CO., LTD.
London, E.C.4. J. MORTIMER HAWKINS,
Managing Director.

Impregnating Plant

REFERRING to "P.H.'s" letter in your issue of the 29th October, I must confess I am simply amazed that, despite the statement in my letter of 15th October, he should still insist that I do not admit that there is scope for vacuum impregnation. If the only reason for the allegation is the fact that I referred to "special types"—I might have said "certain" types or "some" types—it does seem to be rather splitting hairs, and the italics put in by "P.H." tend to alter the implication altogether.

I must also protest at the statement that my claims for non-vacuum impregnation have been exaggerated. My exact comment was that "by the use of suitable varnish, results equal in every way to those obtained by vacuum impregnation can be obtained by the non-vacuum process." I would assure "P.H." that this is no exaggeration, but a statement of fact—borne out by results obtained under normal works procedure over the last five years, during which period some 150,000 wound "components" have been so treated. I do not know the extent of "P.H.'s" experience in non-vacuum impregnation with modern synthetic varnish, but if he

is interested in the same type of products as myself—and I have an idea that he is—I can see no reason why he should not obtain equally excellent results.

The remainder of "P.H.'s" comments refer specifically to varnish, rather than to impregnating plant. This subject is so involved that I think it might be left to the varnish experts—which I am not. There are, of course, certain elementary factors, such as those mentioned by P.H. in connection with viscosity variation, although I feel that he made his comments in this connection with his tongue in his cheek. For instance, no-one would describe a varnish as having good penetrating properties if its penetration depended solely on the fact that excessive solvent had been added. The same remarks apply to excessive dipping temperatures. In considering matters of this sort, one must assume that the material under discussion is in its normal condition, as supplied by the manufacturers for a particular application. I rather emphasized this point when I mentioned a solventless varnish, i.e., practically 100 per cent solid content, which I found had quite remarkable penetrating properties.

Brighton. L.E.S.

[This correspondence is now closed.—Editors, *Electrical Review*.]

Representation in Saudi Arabia

WITH reference to the paragraph "Saudi Arabia Development Plans" on page 683 of your issue of 29th October, the last sentence (which suggests that there is only one firm in Saudi Arabia representing a manufacturer of the equipment required for the electrification of the towns mentioned, and that is an American concern) is not correct, as a number of British manufacturers are interested in such schemes, including the English Electric Co., Ltd. They not only have representatives on the spot, but are actively engaged on at least one of the projects mentioned in the note.

In particular, at Jeddah, arrangements have been made to carry out a complete electrification scheme, including a diesel-driven generating station, high- and low-voltage switchgear and transformers, substations and the necessary distribution networks, both overhead and underground.

ENGLISH ELECTRIC CO., LTD.
London, W.C.2. J. H. M. SYKES,
Press Liaison Officer.

[The note in question was received from the Export Promotion Department of the Board of Trade.—Editors, *Electrical Review*.]

Henley Education Scheme

THE sixth conversazione arranged in connection with the Henley Education Scheme was held on 6th November at the Gravesend Technical College. Sir Edward Crowe, K.C.M.G. (director), presided and outlined the scope of the scheme, referring to part-time day release facilities, trade and student apprenticeships and the special opportunities made available to ex-service and other adult employees. Sir Montague Hughman, chairman of the Henley organization, presented the awards to the successful students. He said that it gave him particular pleasure that the list included a record number of ex-service men and older employees. No less than £20,000 was set aside for educational purposes at the company's last annual general meeting.

Sir John Dalton, director of the Cable Makers' Association, commended the scheme which he described as one of the best of its kind in the electrical industry. After referring to the founder of Henley's, William Thomas Henley, a name which had attained world-wide importance, Sir John spoke of the unbounded scope of the electrical industry.

Dr. P. Dunsheath, C.B.E. M.A. (director and consulting engineer), chairman of the Henley Education Committee, also addressed the meeting, stressing the need for giving the widest interpretation to the meaning of education. This, he stated, was not just a matter of book-learning, but consisted in developing in the students the ability to think for themselves. He thanked all those who had contributed to the success of the Education Scheme, mentioning particularly the education officer, Mr. V. B. Twiss, M.A., and he acknowledged the Committee's indebtedness to the governing body of the Gravesend Technical College and the principal, Mr. E. Guy, M.SC.

Mr. Douglas E. Hill, speaking on behalf of the students, expressed gratitude to the Henley directors for the opportunities which they had made available.

As on previous occasions, a very fine display of students' work was arranged, with various demonstrations and displays of technical interest. An innovation this year was an Exhibition selected from outstanding items which have been shown at past Head Office Arts and Crafts Exhibitions.

Car Dipstick

AN electric dipstick, devised by Mr. Alexander Peet, of Edinburgh, was demonstrated recently to the Royal Society of Arts. Besides performing the normal function of measuring the oil level, the dipstick acts as a heating element, bringing the temperature of the oil to 60 to 65 deg F and facilitating starting without strain on the car battery. The stick can either be operated from a car battery or from the mains through a transformer unit.

Manufacturing Motor Brushes

RESEARCH AND PRODUCTION BY POWELL DUFFRYN

ONE of the oldest names associated with the British coal industry, Powell Duffryn, grew from the original company formed in 1864 to be one of the largest coal-producing concerns in the world. It has always been active in researches into the preparation and utilization of coal and its by-products, but in recent years it has concentrated on carbons for technical purposes. When the colliery interests of the company were nationalized, a research organization was set up under private enterprise to continue and expand the uses of coal as a raw material for the manufacture of technical carbons, fine chemicals and plastics. The research organization, Powell Duffryn Research Laboratories, Ltd., is housed in well-equipped premises at 140, Battersea Park Road, London, and employs a scientific and technical staff of over a hundred people.

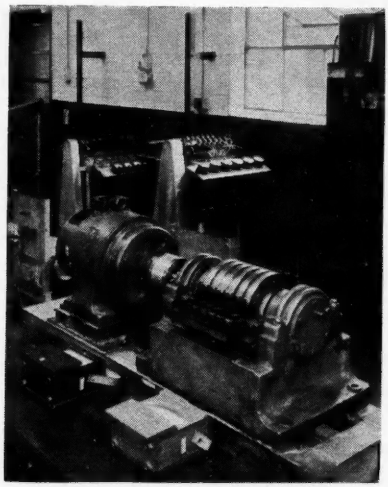
One of the five main laboratories at Battersea

One of the results of this research work has been the preparation of a new form of carbon which has been named "Delanium." The conventional method of carbon manufacture depends upon the binding together of finely divided particles of carbon, made by grinding graphite or some form of coke. The binder is normally a bituminous material, such as pitch or tar, which is subsequently carbonized by kilning. The result is an essentially two-phase body which consists of the original carbon particles cemented together by what is, in effect, pitch coke. The manufacture of "Delanium" also employs a thermal carbonizing

Selection of small motor brushes (left) and large brushes (below)

process, but it can be made without any inert "grog" and the final product is a single-phase homogeneous carbon. This process possesses distinct technical advantages when it is essential to make carbons of an unusual strength combined with a fine structure and great density.

Subsequent testing has indicated that the new process can be made the basis for the development of a range of carbons suitable for motor brushes. For this purpose, a proportion of graphite is added to give the required electrical properties combined with low friction. An important factor in motor brush performance is the shape of the contact drop characteristic curve. The processes involved in the manufacture of "Delanium" carbon lend themselves to the manipulation of this curve. It is possible to make carbons of medium or high resistance, suitable for cases of particularly difficult commutation, which are far less susceptible to damage by overheating at large current densities than the corresponding grades made by conventional methods.



Brush testing machine for speeds of up to 10,000 ft per min

The company has now developed a comprehensive range of brushes using the new material. More conventional materials, such as copper graphite, are employed in cases where they are considered to be more suitable. Brushes, as those illustrated, are made to cover all the important applications to commutators and sliprings, the various grades being divided into five main groups, each containing several grades developed for particular uses.

The "D" grades are "Delanium-graphite" materials and their applications include industrial d.c. machines, fractional h.p. motors and trolley-bus motors. The "E" grades consist of carbon which has been heated in electrographitizing furnaces to a very high temperature, which serves the dual purpose of converting the amorphous carbon into an artificial graphite and of volatilizing any impurities which may be present. The "E" grades have a very wide range of application, including general industrial d.c. machines and traction motors.

The "G" grades are of natural graphite, bonded by a special process. They are very silent running and suitable for high-speed machines. The metal graphite or "M" grades contain copper or copper alloys, together with graphite to provide lubricating properties. Their very low contact drops make them suitable for slip-rings, low-voltage d.c. generators and automobile starters. The "V" grades have a slight abrasive action which is needed on commutators where the mica is not recessed, or where adverse atmospheric conditions make cleaning properties necessary.

The various grades are thoroughly tested in the laboratories and special machines have been installed for determining the properties of experimental and production materials. Application tests have been made in collaboration with leading electrical equipment manufacturers and operators. Brushes have been manufactured on a commercial basis for some time.

These carbons are made by Powell Duffryn Carbon Products, Ltd., Hayes, Middlesex. Modern grinding, mixing, pressing, kilning and machining equipment, together with rigorous inspection at all stages, ensures the highest standards in all products and a dust extraction system maintains a high standard of cleanliness.

Electricity Output

THE output from solid fuel fired generating stations in the week ended 29th October was 887·0 million kWh, as compared with 844·7 million kWh for the preceding week and 824·9 million for the week ended 31st October, 1947. Stocks of coal at electricity undertakings at 30th October amounted to 4,469,800 tons.

High-Voltage D.C. Transmission

DISCUSSION AT I.E.E. MEETING

THE Supply Section paper on this subject which was read at an ordinary meeting of the I.E.E. in London last week was introduced by LORD FORRESTER, who was then in Canada, speaking for ten minutes by radio-telephone from that country. His remarks were illustrated by lantern slides "synchronized" by MR. F. J. ERROLL, joint author, who afterwards summarized the paper (see *Electrical Review*, 5th November, p. 711).

The discussion was opened by MR. C. W. MARSHALL (B.E.A.) who, dealing with continental developments, said that Sweden was very near a solution of the problem. The Swiss had done a great deal, but had found no place in their country where d.c. could be used to any practical degree. The Germans, at the time of their collapse, were probably nearing the stage when they could have used large-scale d.c., but to his mind the development was analogous to that of the dirigible, where we followed Germany's lead with unhappy results.

B.E.A.'s Attitude

This country, after rather a slow start, reached a very high point in the development and use of high-voltage rectifiers, but there was a great gap between anything that we had done and anything that practical engineers would be likely to use in preference to a.c. There was no doubt, however, that British cable manufacturers could easily encompass any d.c. job which came their way. The Germans found that at 400 kV and above an aluminium cable was cheaper than an overhead line, and that might be worth examining further. The C.E.B., however, had good reason to view with caution any project for the immediate application of cables to large power transmission. He was empowered to state that if there was any possibility of using d.c. in this country the B.E.A. would "come in" immediately, even in the development of the apparatus, but if the development was abroad the best the B.E.A. could do would be to give facilities. The only possibility that he saw in the near future was the linking of some of the water-power resources with a single-circuit line. Taking a longer view, there might be use for a very high power line to transmit power from South Wales to London, or from the northern coalfields to the south.

MR. P. J. RYLE (Merz & McLellan) said that d.c. switchgear had a long way to go to catch up, and, moreover, d.c. required considerable extra synchronous condenser capacity, or the equivalent, at the invertor end. On the question of overhead line *versus* cable, at 400 to 600 kV the lines, whether a.c. or d.c., should be lightning-proof and with modern auto-reclosing switchgear an a.c. line would usually be back in service in a fraction of a second, whereas d.c. cables and joints were unlikely to be free from faults so that a fault miles from anywhere might mean the circuit being out of commission for days. The only advantage of d.c. would be if it could transmit the power at less cost. If overall cost was plotted against distance, the curves would intersect at 300-400 miles, but at a very acute angle, so that if d.c. cost 10 per cent more than present estimates the point of intersection would be at 600-800 miles.

MR. H. NIMMO (Southern Electricity Board) referred to a report by Sir Osborne Mance, which mentioned a proposal to construct two 400-kV lines, one from Norway to Italy and the other from Spain to the Ukraine. If d.c. transmission was going to be the answer to transmission beyond 400 miles, he hoped that British manufacturers would take a hand in the new technique.

MR. J. E. CALVERLEY (English Electric Co.) suggested that the d.c. voltages chosen by the authors were very high. An investigation of 20 different schemes throughout the world, involving the transmission of from 100 to 1,000 MW over 250 to 700 miles, showed that they could be carried out with d.c. at 254 or 460 kV, so that there seemed no need for anything higher. Such transmission must, however, have a low priority with manufacturers; to develop rectifiers for 400 kV and over and for hundreds of megawatts, would require years of intensive work and a great deal of money, which would have to be recovered from orders for rectifying equipment only, not for the whole transmission system. The development of rectifiers was therefore likely to be delayed until conditions became clearer.

Effect of Atomic Developments

DR. W. G. THOMPSON (G E.C.) emphasized that the whole future of the transmission of energy would be changed if a convenient method of storing energy on a large scale were found. It might be that to transport uranium rods from a large production centre by air, or to bring them by rail in suitable containers, would be a better solution of the world's power problems in 50 years' time than the transmission of energy by overhead or underground power cables. At the present time there was need for rectifiers for traction and industrial supplies, for a.c. transmission lines, and for the development of atomic energy. If our technical personnel were to be saddled with the development of d.c. transmission as well, we should fail to do some of these jobs properly. The scope for d.c. transmission was across the sea and the desert; both were the homes of the mirage; he hoped that d.c. transmission would not be another.

DR. F. BUSEMANN (E.R.A.) maintained that there was a sufficient field of development for both a.c. and d.c., for a.c. at higher voltages than hitherto when larger powers per circuit had to be transmitted and several intermediate circuits served, and for d.c. where long distances had to be bridged without intermediate distribution and where cables had to be used. British industry to-day had to be more export-minded than ever before and should undertake research in both fields.

MR. W. J. SULSTON (G.P.O.) pointed out that the effects of high-voltage d.c. transmission on communications circuits must be considered. Corrosion due to d.c. traction systems accounted in this country for 15 per cent of the total corrosion of lead-sheathed cables. Apart, however, from the immediate vicinity of terminal stations, where special cables with insulating sheaths might be used, the current density near the surface of the earth might be small so that it did not follow that corrosion would occur in the whole distance between stations.

MR. H. ANGUS (Sweden) speaking in English, said that the Swedish Power Board had decided to undertake a full-scale test of d.c. transmission by connecting the mainland with the island of Gottland, laying as a first connection a single conductor and using the sea as a return circuit. For developing their resources in the north of Sweden they were not using d.c., not being satisfied that they knew sufficient about it.

MR. ERROLL replied briefly to the discussion.

Wireless Telegraphy Bill

Interference Suppression Regulations

THE new Bill to amend the law relating to wireless telegraphy (ordered to be printed on 29th October) is in three parts. By the first, permanent legislation modifies in some details and replaces the Wireless Telegraphy Acts, 1904 to 1926, which have been continued annually by the Expiring Laws Continuance Acts.

In the second part are embodied provisions for controlling, by regulations and enforcement notices, undue interference with wireless reception. The regulations will be made by the Postmaster-General after consultation with an advisory committee appointed from an expert panel to be nominated by the President of the Institution of Electrical Engineers with the approval of its Council.

The regulations may include requirements as to the maximum intensity of electro-magnetic energy of any specified frequencies which may be radiated in any direction or the maximum electro-magnetic energy of any specified frequencies which may be injected into electric lines from apparatus liable to generate energy at frequencies not exceeding three megacycles per second.

Failure to comply with the regulations will not in itself be an offence unless the Postmaster-General has previously served a notice requiring compliance. Such compliance must be immediate when apparatus is liable to interfere unduly with wireless telegraphy used for safety of life or after at least twenty-eight days in other cases, provided that no appeal has been made to the appeal tribunal. The tribunal will consist of three persons of legal experience to be appointed by the supreme judicial authorities for England and Wales, Scotland, and Northern Ireland, and two assessors to be appointed by the President of the Institution of Electrical Engineers with the approval of its Council.

It will be an offence to interfere deliberately with wireless telegraphy.

Part 3 of the Bill contains supplementary provisions, which include one enabling search to be made under the authorization of a Justice of the Peace where it is suspected that apparatus exists that does not comply with the regulations and access has been refused.

E.R.A. Publications

THE British Electrical and Allied Industries Research Association has just published the undermentioned technical reports, which are obtainable from the Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey; prices stated are net.

L/T174, Behaviour of Pressboard under Compression, 18s. L/T175, Conditioning of Industrial Dielectrics, 6s. L/T176, Methods of Maintaining Atmospheres of Known Temperature and Humidity, by C. G. Garton, 6s. L/T177, Tracking in Solid Insulating Materials. A Critical Résumé, by V. E. Yarsley and W. J. Grant, 9s. L/T179, Generalization of a Formula for the Shape of Collision-broadened Spectral Lines, by R. Huby, 9s. 6d. L/T184, Polarization of Dielectrics by Slow Particles, by H. Frohlich and H. Pelzer, 6s. Y/T12, Effect of Cold Inflow Rate, Orifice Design and Storage Water Temperature on Stratification in Domestic Hot-Water Storage Tanks, by M. V. Griffith, 6s.

Railway Electrification

SPEAKING at the "birthday" anniversary luncheon last week of the Institute of Transport, Sir Eustace Missenden, chairman of the Railway Executive, outlined some of the improvements and economies which reorganization of the railway system was bringing about. Electrification was referred to in seven lines at the end of the address. In his view there was still a wide field and urgent demand for the extension of electrification, from the points of view both of economy in operation and the development of traffic and saving this country's precious asset, coal, and he assured his audience that the railway authorities were not idle in that direction nor in their experiments with diesel-electric, diesel-mechanical and gas-turbine locomotives.

Gas Turbines

DEVELOPMENT REVIEWED IN A.S.E.E. LECTURE

LECTURING last week to the Hammersmith branch of the Association of Supervising Electrical Engineers, Mr. Basil Wood (Messrs. Merz & McLellan) spoke of the pioneering work in 1900 of the late Mr. Charles Merz and the simultaneous complementary efforts of the late Sir Charles Parsons to make axial compressors. Their idea was abandoned in England about 1900, but engineers of the Zurich school continued to cherish it.

In 1934 the Sun Oil Co. of America became interested in the Houdry oil cracking process, which required large quantities of compressed air for burning the carbon off the catalyst. Brown Boveri supplied the same machine as they had made for their Velox boiler. Used primarily as auxiliaries, those machines produced a surplus of power. They were tested and started at the makers' works before dispatch by burning oil in a cylindrical combustion chamber. Subsequent machines were made under licence by Allis Chalmers in the U.S.A. and gave great satisfaction in service.

An enlargement of the Houdry machine became the first gas turbine to fulfil expectations in commercial service. It was tested in 1939 before being shown at the Swiss National Exhibition and was finally installed in its permanent home at Neuchatel in 1940. At present there were some 163 gas turbines built, on order, or in construction, of which about 50 were for auxiliary service. The largest, eighteen in all, were to be installed in power stations and accounted for 160 MW out of the aggregate capacity of 160 MW.

Swiss Installations

The only substantial unit in service was at Beznau in Switzerland where a 13,000 kW set was put into service in December, 1947, and a 27,000 kW set was being erected and expected to run this winter. They were needed to overcome summer shortage of the Swiss hydro-electric plant. Erection of the first set commenced one year from date of order and it was running in 18 months. Both were of Brown Boveri make. The 13,000 kW machine ran at 4,750 r.p.m., reduced to 3,000 r.p.m. through gearing. In the 27,000 kW set the h.p. shaft drove the alternator direct at 3,000 r.p.m.

Two similar sets were completed a year or two earlier, one for Lima in Peru and the other for Rumania. Neither was yet running through political and similar difficulties. The Rumanian plant was demonstrated on test in 1946. It was designed to run on natural gas in an oilfield. On demonstration it was put on full load in 7 minutes from standstill. The makers of all these sets had never failed to excel their efficiency guarantees.

Sulzer Bros. were making a 20,000 kW set for installation at Weinfelden, on the same network as Beznau; the completion date was 1950.

A 12,500 kW set was nearing completion by Escher Wyss & Co. for St. Denis, Paris. It was expected to run in 1950. It embodies the closed cycle invented by Dr. Keller and Prof. Ackeret, sometimes spoken of as the A.K. cycle, also as the double isothermal cycle, which closely resembled a steam cycle. Its estimated efficiency was 34 per cent.

British Plant

The first large machine to be ordered for power station work in Britain was to be installed at Dundee on behalf of the North of Scotland Hydro-Electric Board. It was being manufactured by John Brown & Co., Ltd., of Clydebank under Escher Wyss licence. It is similar in design and size (12,500 kW) to the Paris set and erection was due to start in January, 1950, and operation at the end of the year. It would burn heavy "pool" oil at £8 15s. per ton and it was hoped to resort to coal firing later.

In connection with the B.E.A. set of 15,000 kW being made by the Metropolitan-Vickers Co. for the Trafford Park station, special care is being taken of air filtration in view of the dirty industrial atmosphere in which the machine would have to operate. It would burn a distillate fuel oil to avoid ash deposit.

Another 15,000 kW set being built by C. A. Parsons, Ltd., for Dunston "A" power station, Newcastle, represented a big jump from the 500 kW set which had run in their works for over 1,000 hours on a water brake.

Summarizing, Mr. Wood said that if steam cycles could utilize the temperatures of the gas turbine, then steam would show a better efficiency. But it was dangerous to talk in terms of efficiency. What really mattered was fuel cost. In this country coal with a calorific value of 11,000 B.Th.U. per lb. costs about 50s. 6d. per ton whereas the cheapest oil costs £8 15s. per ton with a higher calorific value of 18,500. This price ratio (almost twice) made the 17 per cent efficiency of modern steam plant about equivalent to a gas turbine operating at 34 per cent so that in this country the gas turbine as a basic generating unit would have no future until coal-firing had been attained.

German Lamp Machinery

A report, prepared by the Board of Trade, on "Lamp Machinery Design and Construction in Germany" (B.I.O.S. 1763) is now obtainable from H.M. Stationery Office, price 2s.

NEW BOOKS

Telemetering Practice : Problems for Students

The Principles and Methods of Telemetering. By P. A. Borden and G. M. Thynell. Pp. 230; figs. 106; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 27s. in U.K.

Little published information is available to-day on the subject of telemetering and this American book will be a welcome addition to the electrical engineer's library. Although written from the American viewpoint, this in no way detracts from its value to the British engineer. The whole art of telemetering is discussed by the authors and an attempt has been made to bring together under one head the various systems now available. The volume introduces the lay reader to the subject and then, after classifying the various systems in their different categories under current, voltage, frequency, position and impulse systems, provides continuity to a catalogue of the various forms in common use.

The transmission medium becomes increasingly important in modern telemetering when large numbers of remote measurements are necessary. In the later chapters of the book the various forms of transmission media are ably described and some discussion on the applications of telemetering systems finishes the story which, though not pretending to be complete, provides an admirable basis for the art. Some of the later and more modern systems are not mentioned, but the book will find its place as the standard reference and text on telemetering. The general lack of co-ordinated information on the subject makes the bibliography and the list of patents contained in the appendices of considerable value and the book necessary to any technical reference library.—K.B.B.

Small A.C. Transformers. By A. H. Avery (Revised edition). Pp. 76; figs. 45. Percival Marshall & Co., Ltd., 23, Great Queen Street, London, W.C.2. Price 3s.

This pocket sized manual is a revised edition of a useful little book which was first published in 1932. It is non-mathematical and being written from the practical viewpoint is likely to be of use to first year students and home constructors of radio receiver components. Distinctions are made first between the various transformer types and their uses, followed by a description of the cores likely to be encountered in light electrical and radio work. Simple rules are then given for design procedure and the calculation of windings, together with a specimen design for a car battery charger transformer. Assembly of parts and testing are discussed in some detail, supplemented by numerous illustrations and circuits. In conclusion the author treats of battery charging with rectifiers and gives details of thermionic and dry plate rectifier construction. There is also an appendix containing particulars of a selection of stock sized core stampings.—R.P.

Problems in Electrical Engineering (with answers). By S. Parker Smith, D.SC., M.I.E.E. Pp. 278 (Fifth edition). Constable & Co., Ltd., 10, Orange Street, London, W.C.2. Price 10s.

A further revised and enlarged edition of this most excellent book is indeed most welcome. For many years now it has been invaluable to students of all grades and since it was first published in 1929 efforts have been made to keep it up-to-date. In the first edition there were 792 problems; in the present edition there are 1,696. With such a large number it has been thought desirable to re-arrange the problems into chapters under the titles in the classification, placing the more elementary ones at the start of each section. Apart from these alterations the principles on which the book was first published have not been changed.—R.P.

"The Autocar" Handbook. By *The Autocar* Technical Staff. 20th edition. Pp. 242; illustrated. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 5s. (postage 3d.).

This completely revised edition of "The Autocar Handbook" with its illustrations, follows the same lines as its predecessors, being written with the intention of explaining the mechanism of the car to motorists who do not possess abundant technical knowledge.

The electrical section has been simplified, since a knowledge of the theory underlying the construction of the electrical accessories is not necessary to the general car owner. On the other hand, a general and accurate idea of the wiring and its purpose and the means of connecting the various accessories, is extremely useful knowledge.

Books Received

The Amplification and Distribution of Sound (2nd Edition). By A. E. Greenlees, A.M.I.E.E. Pp. 302; figs. 108; index. Chapman & Hall, Ltd. Price 16s.

Introduction to Television. By A. Folwell. Pp. 120; figs. 48; index. Chapman & Hall Ltd. Price 9s. 6d.

Non-Ferrous Metals & Alloys. By E. Gregory, PH.D., and E. N. Simons. Pp. 196; figs. 31; index. Paul Elek, 38, Hatton Garden, London, E.C.1. Price 12s. 6d.

Cathode Ray Tube Displays. By T. Soller, M. A. Starr and G. E. Valley. Pp. 721; figs. & index. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price 60s. in U.K.

COMMERCE and INDUSTRY

Relaxation of Controls. T.U.C. Productivity Report.

MR. H. WILSON, President of the Board of Trade, and Mr. G. Strauss, Minister of Supply, announced last week the withdrawals of regulations governing the manufacture and supply of industrial and consumer goods and materials. The Wireless Receivers and Radio-gramophones (No. 1) Order, 1947, will be revoked from 1st December, and most of the products controlled by the Machinery, Plant and Appliances (General) Orders, 1945-46, will be released from statutory control, including steam generating plant; electric lamp-making machinery; electrical machinery and plant; furnaces; accumulators; and electro-plating machinery.

Torch Battery Price Increases

The Board of Trade, in consultation with the Central Price Regulation Committee, has made an Order (the Electric Torch Dry Batteries (Maximum Prices) Order, 1948), which fixes revised maximum prices for home-produced electric torch dry batteries from 22nd November next. There will be increases of ½d. to 1½d. in the maximum prices of large unit cell batteries, standard flat batteries and large twin-cell cycle lamp batteries.

E.C.A. Events in 1949

It is stated in the official journal of the Electrical Contractors' Association that it is intended that the E.C.A. annual dinner shall be revived in January. The Association also proposes to hold a conference next year, possibly in June and probably in the south of England. The last E.C.A. conference was at Brighton in 1939.

Unions and Production

A report by the General Council of the T.U.C. which is to come before a special conference of trade union executive committees in London next week examines and makes recommendations on the ways in which trade unions can assist in increasing industrial productivity.

The report, referring to the wasteful use of labour through under-employment in certain industries, says that the solution of the problem may mean transfer of membership and the adoption of measures not universally popular, but the difficulty must be tackled if a policy of full employment and maximum production is to succeed. Excessive turnover of labour (in many industries at the rate of 50 per cent a year) is considered to be frequently a symptom of underlying difficulties, and union executives are urged to examine the condition where it exists. With regard to restrictive practices, the General Council states that both sides of industry are concerned. Demarcation problems create difficulties in efficient working and should be examined in the light of full employment. Joint production committees are not being formed with enthusiasm over wide sections of industry and executives are asked to examine the difficulties preventing their wider adoption.

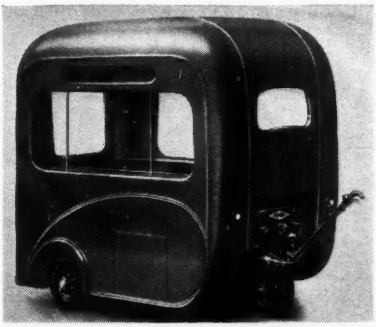
Training schemes for management and to improve efficiency should receive more active co-operation from the unions. The training of shop stewards should be considered, and more unions should take advantage of courses in research and training for specific industries conducted by some universities and technical colleges. Finally, union officers must be equipped and trained to enable them more effectively to serve the members.

Memorial Prize

Twenty-five years after the retirement of Prof. Magnus Maclean from the chair of electrical engineering at the Royal Technical College, Glasgow, his memory is to be perpetuated by an annual prize in the College. Glasgow Skye Association is behind the memorial project, which had to be postponed during the war years.

Battery-Electric Ice-Cream Kiosk

A pedestrian-controlled battery-electric vehicle fitted with a body which is suitable for the retail sale of ice-cream and light refreshments is now in course of production at the works of Diamond Motors (Wolverhampton), Ltd., Upper Villiers



New "Grailseley" pedestrian-controlled vehicle

Street, Wolverhampton. This vehicle is one of the first of its kind to be made and is intended for use in parks, recreation grounds and the like, such parking places to be within a few miles of the charging point. It is powered by a

1-h.p. B.T.H. motor which gives it the speed of a good walking pace (3-3½ m.p.h.) and is fitted with a patented reversing and isolating switch. The body is principally constructed of aluminium panels and the interior is lined with plastic and aluminium panels.

Educational

A course of eight lectures on boiler house control systems and their operation in modern electricity generating stations will be given on Fridays commencing on 3rd December at the L.C.C. South East London Technical College, Lewisham Way, S.E.4. Particulars can be obtained from the Head of the Electrical Engineering Department.

Electrical Housecraft Course

A two-day course in electrical housecraft for teachers, organized by the Electrical Association for Women, is being held on 12th and 13th November. After the welcome at the E.A.W. Headquarters on 12th November by the director, Dame Caroline Haslett, the opening address will be given by Mr. H. J. Randall, chairman, London Electricity Board. Two sessions will follow on "Selection and Use of Large Scale Equipment" and "The Peak Load and You." At the E.L.M.A. Lighting Service Bureau in the afternoon delegates will be welcomed by Mr. W. J. Jones, director of the E.L.M.A., and will hear a lecture on "From Darkness into Light." On Saturday morning two sessions are arranged at the London School of Electrical Domestic Science, one on "The Use and Misuse of Electrical Appliances with Practical Applications," and the other on "Practical Work in the Science Department." After lunch at E.A.W. Headquarters, discussion will take place on "Electrical Needs in the Schools," following a talk on the E.A.W. certificates and diplomas for teachers, demonstrators and homeworkers.

Equipment for Iraq

The Iraq Government recently allotted £146,000 for purchasing electrical and water pumping equipment for municipalities.

Landing Lights for Helicopters

Regular services by helicopter require some modification of existing airfield lighting methods, and the General Electric Co., Ltd., has been collaborating with the Experimental Unit of British European Airways in developing new equipment for the night trials now being carried out from Westwood Aerodrome, Peterborough.

Iron and Steel Corrosion

The Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1, has recently published "Prevention of Iron and Steel Corrosion," by C. Dinsdale, M.SC., F.I.M. (67 pages, two appendices and index; price 5s., postage 3d.). It is claimed that this book is a complete index of the processes and published specifications relating to the prevention of the corrosion of iron and steel. The matter is divided into three parts dealing respectively with methods of preventing corrosion; cleaning metal parts; and codes of practice. Among the methods of preventing corrosion referred to are metallic coatings; oxide, chromate and phosphate coatings; paper wrappings; dehydration and electrolytic methods and water treatment.

Anglo-American Productivity Council

One of the first acts of the Anglo-American Productivity Council, which is exploring ways of increasing British production efficiency, has been to set up a series of committees to study various aspects of the subject. They will deal with plant visits and exchange of production techniques; maintenance of productive plant and power; productivity measurements; specialization in industrial production; and economic information. Visits of British industrialists and trade union representatives to factories in the United States are being arranged and it is hoped that there will be reciprocal visits by Americans to British works. It is also intended that parties shall study the best practice in British factories to bring about more general knowledge of the best practice here for others to emulate.

Plastics Certification Mark

A certification mark for plastics and articles made from plastics, sponsored by the British Plastics Federation and the British Standards Institution, will ensure, by the allocation and use of the mark, that materials and articles made therefrom are correctly manufactured according to the relevant British Standards Specifications. The "Plastics Mark" is in the form of a circle with the initials B.S. in the centre, indicating British Standard, and the initials B.P.F. on the left-hand side, referring to the British Plastics Federation. In practical use, code letters and numbers on the right-hand side refer to the manufacturer and the specification concerned. At present, the certification scheme is applicable only to moulding powders made from phenol formaldehyde and urea formaldehyde resins and certain mouldings made therefrom.

Model Contract Conditions

Discussions between representatives of the Councils of the Institutions of Mechanical and Electrical Engineers last year culminated in a joint recommendation to the two Councils that model general conditions of contract should be prepared suitable for use by the mechanical and electrical engineering industries. The two Councils endorsed this recommendation and appointed a committee including members who had served on the existing electrical committee, with additional members

representing the mechanical engineering industry. This joint committee has now prepared "Model General Conditions of Contract 'A' for Home Contracts, with Erection" suitable for the mechanical and electrical engineering industries, copies of which are available at 5s. each, including postage, from the secretary of either Institution. With the issue of these new conditions the electrical "Model General Conditions of Contract 'A'" have been withdrawn from sale and it is hoped that the new conditions will be used for all future contracts to which they are applicable.

Ediswan Sales Conference

The recently enlarged Edison-Swan Electric Co., Ltd., has just held its first general sales conference. Branch managers from all parts of the country met in London and with the directorate and departmental heads an intensive programme was undertaken. The itinerary, spread over four days, included a visit to the factories at Ponder's End, Brimsdown, Rugby and Leicester where all the manifold products of the company were closely inspected and the modern manufacturing processes explained by skilled operatives.

Dissolution of Partnership

Messrs. W. H. Curtis and A. M. Aubrey, carrying on business as radio and electrical dealers at 78 and 82, London Road, Sheffield, and at 60, Page Hall Road, Sheffield, under the style of Curtis and Aubrey, have dissolved partnership. Mr. Curtis will attend to debts and carry on the business under his own name.

Ekco Window Display Results

The first prize of £100 in the Ekco "Princess Portable" £250 window display competition which ran during August and early September has been awarded to Crane & Sons, Ltd., Liverpool; the second prize of £50 to Southern Radio Service, Southampton; and the third prize of £20 to E. Upton & Sons, Middlesbrough.

Trade Announcements

British Moulded Plastics, Ltd., has recently reorganized and expanded its sales organization. Mr. M. J. Nash is manager for home sales and Mr. W. J. Fluckiger manager for export sales. The reorganization includes the appointment of Eaton Plastics, Ltd., as sole distributors for stock mouldings. Caledonian Plastics, Ltd., sole distributors for Scotland, have now also been appointed sole distributors for Northern Ireland.

As from 1st January next the sole selling rights of Sigma instruments in the home market will be transferred from **E. H. Jones (Machine Tools), Ltd.**, to **Alfred Herbert, Ltd.** E. H. Jones will be the sole export distributors for Sigma measuring instruments and the sole agent home and export for the Sigma milling and drilling machine.

Trade Publications

The Plessey Co., Ltd., Ilford, Essex.—Folder describing the "A" type automatic gramophone record changer.

Stewarts & Lloyds, Ltd., Brook House, Upper Brook Street, London, W.1.—Illustrated folder of tubular steel columns for public lighting.

James Gordon & Co., Ltd., Dalston Gardens, Stanmore, Middlesex.—Catalogue H34 on automatic boiler control systems. A French edition of this catalogue is also available.

C. J. Callander & Co., Bank Parade, Raynes Park, London, S.W.20.—Leaflet on the "Lewker" portable washing machine.

The Sun Electrical Co., Ltd., 118-124, Charing Cross Road, London, W.C.2.—Priced catalogue of cables, flexibles and wires.

E. K. Cole, Ltd., Southend-on-Sea, Essex.—Priced folder illustrating four domestic radio receivers and a radio-gramophone.

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 3rd November:—

PERIDON. No. 659,411, Class 9. Electrical apparatus and instruments included in Class 9, scientific and radio apparatus and instruments, and parts included in Class 9 of all such goods.—English Electric Co., Ltd., Queen's House, 28, Kingsway, W.C.2.

MOTOROLA. No. 655,818, Class 9. Radio transmitting and receiving apparatus, gramophones, radio-gramophones, etc., and parts included in Class 9 of all such goods; electrically operated apparatus for controlling the amount of fuel to heating apparatus for vehicles, electric coils and electric resistors, etc.—Motorola Inc., Chicago, Illinois, U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

POLOCAST PRODUCT (design). No. 660,286, Class 9. Electrical fittings, included in Class 9, all being pressure die-castings in zinc base alloy.—William Barclay Stewart, trading as Alexander Pollock & Co., 14, Antigua Street, Edinburgh.

WESTEHT. No. 664,498, Class 9. Electric alternating-current rectifiers, parts and fittings, all included in Class 9.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

CERBERUS (design). No. 663,038, Class 9. Electrical apparatus and instruments included in Class 9, and alarms.—Cerberus G.m.b.H., Bad Ragaz, Switzerland. Address for service: c/o Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

ALPHA. No. 660,968, Class 11. Electric heating apparatus for greenhouses.—Farm & Garden Electrification, Ltd., Alpha Works, Havelock Road, Southall, Middlesex.

Electricity Supply

Douglas Engineer's Report. Water Power in British Columbia.

Bridge of Allan.—STREET LIGHTING.—The main thoroughfare is to be equipped with electric lighting with concrete lamp standards, at a cost of over £3,000.

Douglas (I.O.M.).—MUNICIPAL UNDERTAKING'S REPORT.—In Douglas, where the electricity undertaking remains under municipal control, the report of the borough electrical engineer and manager (Mr. C. Andrews) records a 10·8 per cent increase in electricity generated during 1947-48. Sales within the undertaking totalled 11·2 million kWh (against 10·4 million in 1946-47) and 13·0 million kWh (11·2 million) was supplied in bulk to the I.O.M. Electricity Board. In spite of the greater output, slightly less fuel was used and this improvement was reflected in a decrease in working costs per kWh sold (which had been steadily rising since 1940) to 1·397d. against 1·44d. in the previous year. Average revenue per kWh sold (total supply) was also lower (1·722d. against 1·83d.). Aggregate income amounted to £191,404, there being a gross profit on the year of £35,758 and a balance on the net revenue account of £6,402 which has been transferred to reserve. Contracts have been placed for the extension of the Pulrose generating station by the installation of a 5,000-kW turbo-generator and two 60,000-lb-per-hr boilers, which it is hoped to have in operation by the winter of 1950. The first stage of a programme for changing the d.c. supply to a.c. has been put in hand.

Sheffield.—NEW STATOR COMPLETED.—C. A Parsons & Co., Ltd., have completed a 106-ton stator for installation at Sheffield. Special arrangements have been necessary to convey the stator by rail and the journey will take three weeks.

Suffolk.—UNECONOMIC RURAL SUPPLIES.—The Eastern Electricity Board has informed the Wainford Rural District Council that it is unable to supply electricity to St. Lawrence, St. Cross and Westhall because these villages are so sparsely populated that they would not repay the capital expenditure involved. The Council has decided to make strong representations in the matter to the local M.P.

DOMESTIC EQUIPMENT.—Because it considers electrical apparatus too costly to operate, the Council has rejected a suggestion that electric cookers and coppers should be installed in houses being built at Shadingfield and Wissett.

Overseas

Canada.—ELECTRICITY SHORTAGE.—Canada, one of the world's richest nations in potential hydro-electric power, is suffering from an acute shortage of electricity. "Black-outs" have been imposed in many of the principal cities. Work on the new hydro-electric plants is being speeded up, but it is estimated that the shortage will not be remedied before 1952. Latest restrictions make it an offence for a householder to use electricity for heating, except in the case of sickness. Electric grates in artificial fire-places are banned, and so are portable electric radiators and space heaters.

BRIDGE RIVER SCHEME.—The first 62,000-h.p. unit of the Bridge River hydro-electric project—the largest in Western Canada—developed by the British Columbia Electric Railway Co., 130 miles north-east of Vancouver, went into operation on 23rd October, nine months ahead of schedule. A second 62,000-h.p. unit will be in operation next February and a third next October. The total estimated cost of the first three units is $22,000,000 excluding $5,000,000 spent earlier for building of the first tunnel, town site and procurement of rights of way. Approximately $5,000,000 of the $22,000,000 expenditure is toward the cost of the next seven units of the ultimate ten-unit development of 620,000 h.p. A 130-mile transmission line built through some of the most mountainous sections of British Columbia carries the power to Greater Vancouver and Lower Mainland areas. The line is designed and built with a normal carrying capacity of over 200,000 h.p. at 230 kV.

TRANSPORT

Southern Region.—ANOTHER ELECTRIC LOCOMOTIVE.—A new electric locomotive (No. 20003) is now undergoing trials and will shortly go into service on the Southern Region of British Railways. Although incorporating several improvements, it is similar in design to the two previous locomotives of this type built during the war and which have already successfully run more than half a million miles hauling heavy freight trains between London and the South Coast. This new locomotive can be used for both passenger and freight services over the electrified lines, and is capable of hauling passenger trains up to a speed of 75 m.p.h. and 1,000-ton goods trains. It can operate continuously for several days and nights. The engine weighs 105 tons; it is 58 ft 3 in. long over buffers, and has a maximum tractive effort of 45,000 lb.

Sweden.—ELECTRIC RAIL BUS.—A new electric rail bus constructed by the Svenska Järnvägsverkstäderna has seating accommodation for 46 or 48 passengers and will attain a speed of 54 m.p.h. The speed is regulated by a high-voltage control system which permits starting without jerks, while a "fluid drive" resembling that used in automobiles, with rubber gear wheels, transmits the power from gear box to driving shaft.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

Erinoid, Ltd., reports a trading profit of £130,661 for the year ended 31st July last, as compared with £188,468 for 1946-47, and a net balance of £56,664 (against £67,624). The ordinary dividend for the year is unchanged at 15 per cent, but no bonus is paid this year (against 5 per cent). The balance carried forward is £23,388 (against £21,378).

Radio Rentals, Ltd., is offering to ordinary shareholders 50,000 additional 5s. ordinary shares at 20s. each in the proportion of one new share for each ten shares held. The new shares will not be entitled to the dividend for the year to 31st August last.

Bennis Combustion, Ltd., reports a trading profit for the year to 30th April last of £61,884, as compared with £43,628 for the preceding year and a net balance of £22,030 (against £17,512). The ordinary dividend for the year is maintained at 12½ per cent and the balance carried forward is £8,183 (against £3,938 brought in).

Max Stone, Ltd., reports a consolidated trading profit for the year to 30th June last of £170,210, as compared with £157,075 for the preceding year, and after providing for depreciation, profits tax, tax reserve, etc., there is a balance of £58,012 (against £51,164). After providing additional taxation (£2,801), and placing £5,000 to general reserve, it is proposed to pay a final ordinary dividend of 15 per cent (against 20 per cent), making 40 per cent (same) for the year. The balance carried forward is £45,274 (against £21,800 brought in).

In his statement issued with the report and accounts, Mr. C. W. Hayward (chairman) says that it had been the directors' intention to recommend the payment of a final dividend of 25 per cent, which would have been amply justified by the company's earnings, but to conform with the dividend limitation the board has decided to recommend a final of 15 per cent.

Glenfield & Kennedy, Ltd., have arranged that the financial years of all the companies within the group shall end at the same date, and it is proposed that the next accounts of the company should be presented in June, 1949, for the nine months' period ended 31st December next. The interim dividend of 5 per cent just announced covers a nine-month period.

Crabtree Electrical Industries, Ltd., has announced a second interim dividend of 5 per cent.

Drake & Gorham, Ltd., have announced a dividend for the year of 5 per cent (same.)

The Britannia Electric Lamp Co., Ltd., is maintaining its dividend for the year at 12½ per cent.

Richard Johnson & Nephew, Ltd., have declared an unchanged interim dividend of 5 per cent.

New Companies

Meterite Electrical Co., Ltd.—Registered 29th October. Capital, £300. To acquire any patents, brevets d'invention, etc. Directors: R. M. Cavendish and N. J. Roberts. Regd. office: Whiteside's Buildings, Back Glen, Eldon Road, Lytham St. Annes.

E.M.I. Relays (Uxbridge), Ltd.—Registered 29th October. Capital, £15,000. Technical advisers or consultants, electrical and wireless engineers, etc. The directors are to be appointed by the directors of Electrical & Musical Industries, Ltd. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Thermostatic Electric Heating Co., Ltd.—Registered 29th October. Capital, £7,000. To acquire the business of an electrical engineer carried on by W. E. Holloway at Birkenhead. Directors: W. E. Holloway and T. H. Yarrow. Regd. office: 59, Hamilton Square, Birkenhead.

Bankruptcies

I. R. Meredith, 6, Newton Villas, Porthcawl, Glam., electrical engineer.—Receiving order made 28th October on a creditor's petition.

T. Riley, residing at The Haven, Boundary Lane, Mossley, Congleton, Ches., and lately carrying on business at 58, Station Road, Tunstall, Stoke-on-Trent, electrical contractor.—Last day for receiving proofs for dividend 17th November. Trustee, Mr. F. C. Ormrod, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

R. Hampson, Yew Tree Bungalow, Hall'ith' Wood, Astley Bridge, Bolton, Lancs, electrical engineer, lately trading with Albert Mearns as the Northern Supply Co., 28, Victoria Square, Bolton, electrical engineers.—Application for discharge to be heard on 1st December at the County Court House, Mawdsley Street, Bolton.

C. Cakebread, residing at 26, Garnault Road, Forty Hill, Enfield, Middlesex, maintenance electrician.—Last day for receiving proofs for dividend 19th November. Trustee, Mr. J. M. Clarke, 20, Eaton Place, London, S.W.1.

C. A. Jay, Dale House, Dipton, Durham, and carrying on business as electronic instrument maker, under the name of A. G. Jay & Co., 32, Clayton Street West, Newcastle-on-Tyne.—First and final dividend of 3s. 0½d. in the £, payable 19th November at the Official Receiver's Office, Gibb Chambers, Westgate Road, Newcastle-on-Tyne.

Liquidations

Emor Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. P. Phillips, 76, New Cavendish Street, London, W.1. Particulars of claims to the liquidator by 6th December.

STOCKS and SHARES

BUSINESS in the Stock Exchange still comes somewhat spasmodically, one day seeing active markets and the next being a very quiet session. A continuing feature is the strength of British Government and similar gilt-edged stocks, in which group both the Electricity and the Transport "threes" remain popular. The new Electricity 3 per cent scrip, now 35 per cent paid, is standing at 11s. 3d. premium over the issue price of 99½. Substantial sums are being invested in the ordinary shares of front-rank industrial companies, amongst which those of many of the electrical manufacturing concerns are numbered. New issues attract a fair amount of support, though demand is perhaps more selective than it was two or three months ago. It is known that between now and the end of the year a number of newcomers are to be offered for public subscription.

Electrical Equipment Shares

Last month's issue of £100 million new Electricity stock was, of course, an arresting advertisement for shares in the companies interested in generating plant and other works. Leading electrical equipment shares maintain, accordingly, a reputation second to none in the industrial markets. As noted here last week, first-class industrials are tending to move parallel with gilt-edged prices, with an interval of about 1 per cent between the respective yields. Keeping step with the progress of long-dated Government stocks to a 3 per cent basis, many industrials have travelled, by easy stages, to materially higher prices over the past three or four months.

Four Per Cent

British Insulated Callender's shares are as good an example as any of the willingness of investment to accept something less than 4 per cent on the money from a dividend-limited equity, provided the general qualifications are high enough. At 34s. the yield on the last dividend works out at £3 18s. 6d. per cent. Another share in the under four per cent category is Automatic Telephone ordinary at 63s. Yields on General Electrics, A.E.I., Henley's, Reyrolle and C. A. Parsons are all within a few pence either side of the mark.

Company News

Drake & Gorham have declared a sixth successive dividend of 5 per cent. Bargains are recorded very rarely in the £1 ordinary, quoted nominally at their par value, but the 5 per cent redeemable preference shares change hands occasionally at about a guinea. Burco 5s. shares have gone back to 23s. 6d., and pay 7 guineas per cent on the dividend recently maintained at 35 per cent for the year ended last September. Cable & Wireless arbitration prospects have been retarded by the appointment of Lord Uthwath, the head of the tribunal, to another arbitration board sitting on 29th November. This has not subdued the ordinary stock, which has risen 3 points to 213½. Globe Telegraphs sympathetically hardened to 48s. 9d. Dictograph Telephones' offer of new 2s. ordinary at 5s. is about 1s. below the market price of the existing shares.

Changes on the Week

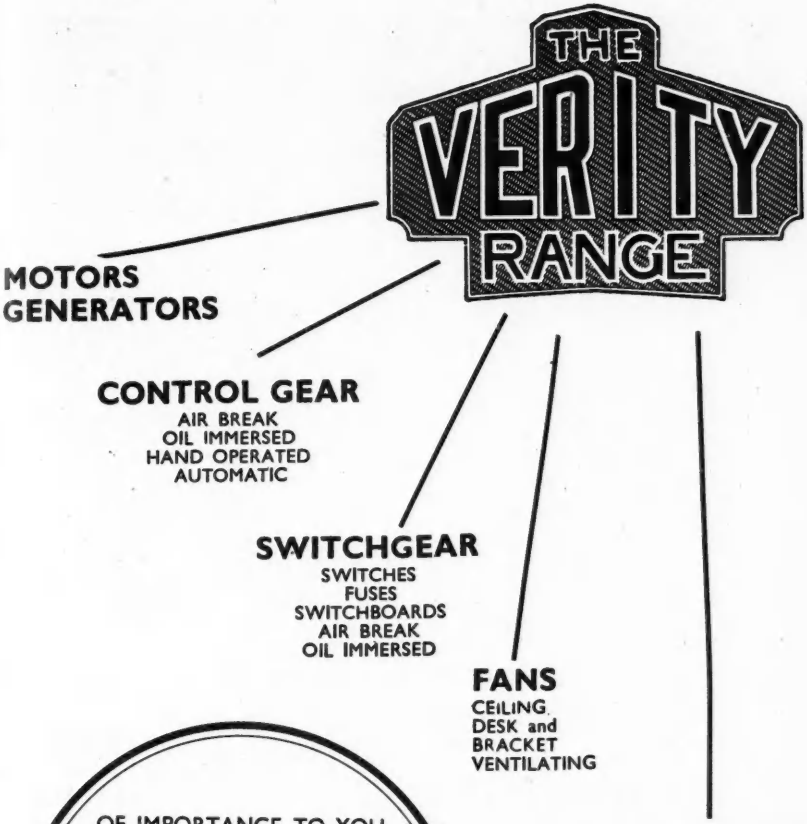
Thomas Tilling shares have risen to the level £6; official news as to how the compensation money is to be dealt with should be available this week. British Electric Traction recovered 80 points, rising to 2045. De La Rue at 39s. 3d. are 2s. 3d. better. Hoovers have rallied from the effect of the new issue, and now stand at 37s. 6d., a rise of ¼. Shares to gain $\frac{1}{16}$ include Metal Industries, 47s., Murex, 93s. 9d., Revo, 60s. 9d., Plessey, 17s. 6d., Walsall Conduits, 57s. 6d., and International Combustion 43s. 9d. On the other side of the sheet, Jerusalem Electric are lower at 16s. 3d. and Oriental Telephone at 53s. 6d.

Canadian Electrics

The market in Canadian securities was in no way affected by the surprise which attended the result of the United States Presidential Election. In the American market, heavy falls occurred on the day following publication of the news, though part of the decline was subsequently recovered. There are a number of Canadian electric and hydro-electric companies whose issues are quoted in the London Stock Exchange, but, as already mentioned, the return of President Truman had no effect in the market: Shawinigan Water & Power common shares, for instance, were unchanged at $37 and Quebec Power common shares remained at $22. British Columbia Power Corporation "A" shares are quoted at 42 and the "B" at 5 (dollars in both cases). International "Tel. & Tel." (a U.S.A. company) lost 1½ to 18½ in the Wall Street fall.

Tube Investments

This company holds nearly £446,000 deferred stock and 625 liaison shares in Stewarts & Lloyds, which latter is on the Government's list of steel companies to be nationalized. These together are calculated to be worth in the neighbourhood of £3 million, on the basis of the proposed compensation prices. Conversely, Stewarts & Lloyds hold about £225,000 ordinary stock and 500 liaison shares in Tube Investments. These liaison shares each carry one thousand times the rights of £1 ordinary stock. Under nationalization, therefore, the Iron and Steel Corporation would command half a million votes in Tube Investments. "Tubes" shares have lately been active, rising over the past month from 6¼ to $6\frac{7}{16}$ and reacting to the former figure. At 6¼ they afford a yield of 4 per cent, which suggests little anxiety about the possibility of changed circumstances.



OF IMPORTANCE TO YOU

In order that we may give you the best service under the present difficult conditions we appeal to you to utilise standard equipment, ratings, etc., whenever possible. Your co-operation in this respect will enable us to concentrate on standard production with consequent reduction in despatch time.

USE "STANDARD"

VERITYS Ltd.

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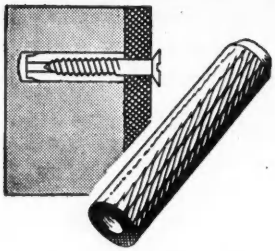
Works : ASTON, BIRMINGHAM 6

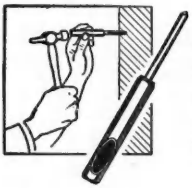
RAWLPLUG PRODUCTS

In big demand at all times



RAWLPLUGS AND OUTFITS

The demand for Rawlplugs continues to grow, because they are the most satisfactory method of making permanent fixtures in all materials. Rawlplugs are in ample supply, so you can lay in a good stock for every size of screw. Rawlplug Popular, Household and Handyman Outfits are three fast-selling lines showing good profits.



There is a Rawltool for every hole boring job. Rawldrills for Rawlplugs, Stardrills for Rawlbolts. Wall boring and Tubular boring tools for penetrating jobs. If you have not got details, ask for them now.

B343 B

A grand selling line is the Rawlplug Electric Soldering Iron. Every handyman, workman and engineer is a potential buyer of one of these guaranteed tools, so lay in a stock now and show them in your windows and on your counters.

Duroglue is a British adhesive of tremendous strength, which will permanently repair many household articles of wood, paper, cloth, pottery, etc. Even leather, when cleaned of grease and sandpapered, can be fixed with Duroglue. Sold in handy tubes and tins.

The colourless, heat and waterproof adhesive which will repair glass, china, pottery and a host of other household things besides. A money saver for your customers and a money maker for you. Stock up with Durofix.

Dries like wood. Can be cut, planed, polished and painted like wood, will take screws and nails like wood. Rawlplug Plastic Wood is accepted by all woodworkers, handymen and modellers as the best quality product of its kind on the market.

Weight for weight and quality for quality, Rawlplug Cored Solder is easily the finest value in easy-flowing resin cored solder on the market. Wound on handy cards and packed in bright display outers, Rawlplug Cored Solder will sell on sight.

Free Display Material is supplied with all Rawlplug fast-selling lines

THE RAWLPLUG CO. LTD., CROMWELL ROAD, LONDON, S.W.7

Australian Imports

LESS POWER PLANT IN 1946-47

IMPORTS of electrical goods into Australia in 1946-47 declined in value on 1945-46 the total being £A4,820,000, against £A5,051,000. Figures for the principal groups, extracted from the official trade returns issued in Canberra, are given in the accompanying table.

Noteworthy among the imports that declined were generating plant, some of the heavier switchgear, radio goods and most cable. The United Kingdom and the United States remained the chief suppliers.

While imports fell, exports of electrical goods increased by about 75 per cent; details will be given in a subsequent issue.

Class of Goods	1946/47 £A (000)	Inc. or dec. on 1945/46
Power cable, lead-covered and armoured, paper insulated	66*	− 13
Ditto otherwise insulated	44	− 9
From United Kingdom	42	+ 41
„ United States	2	− 1
Other covered power cable	182	− 122
From United Kingdom	173	− 99
„ United States	8	− 24
Telegraph and telephone cable and wire, lead-covered and lead-armoured and covered	56	+ 39
From United Kingdom	51	+ 34
„ Canada	4	+ 4
Other covered telegraph and telephone cable and wire	48	− 18
Dry batteries and cells	2	− 23
Ditto, parts	1	− 7
Storage batteries and parts	145	+ 102
From United Kingdom	44	+ 20
„ United States	71	+ 54
Enamelled wire not covered	33*	+ 17
Ditto, covered	36	+ 8
Sparking plugs	255*	+ 227
Dynamos and magnetos for motor vehicles and cycles	80	—
Starter motors, 24 V and under, for motor vehicles	17	+ 4
A.c. generator set units	2	− 5
D.c. generator set units	43	+ 18
Alternators for turbines	78	− 112
From United Kingdom	71	− 120
„ United States	—	− 99
Other alternators	40*	− 5
Generators for turbines	23	− 15
From United Kingdom	10	—
„ Sweden	—	—
„ Switzerland	12	—
Other generators	63	+ 25
Other current generating machines	11	− 43
Motors under 1 h.p. except as parts of machines	302	+ 200
From United Kingdom	208	+ 151
„ Canada	68	+ 41
„ United States	25	+ 7
Motors 1 h.p. and over a.c. induction (non-commutator type)	170	+ 86
From United Kingdom	134	+ 64
„ Canada	2	− 2
„ United States	33	+ 23
Ditto, other	35	+ 7
From United Kingdom	20	− 2
„ United States	7	+ 1
D.c. motors for gearless lifts	3*	—
Other d.c. motors	61*	+ 48
Motors, universal	7*	+ 4
Convertors, frequency changers and rotary transformers	9*	− 4
Circuit breakers or switch units above 15 kV	139*	− 108
Heating and cooking appliances	204	+ 159
From United Kingdom	135	+ 98
„ United States	7	+ 1
Measuring and recording intruments	152	+ 5
From United Kingdom	90	+ 1
„ United States	54	—
„ Switzerland	6	+ 3
Lamps, filament, automobile	42	+ 11
From United Kingdom	15	—
„ United States	24	+ 9
Lamps under 20 V, flashlight	18	− 6
From United States	7	− 8
„ Canada	2	− 5
Other lamps under 20 V	28	− 14
Lamps 20 V and over, gas-filled	21	− 2
From United Kingdom	7	− 6
„ United States	12	+ 2
Other lamps 20 V and over	35	+ 7
From United Kingdom	12	− 5
„ United States	14	+ 3
Mercury vapour, etc., tubes	15	+ 3
Lightning arrestors other than radio	31†	+ 9
Liquid slip regulators, thrustors, etc.	53*	+ 42
Switches, cut-outs and choke coils	102	+ 25
From United Kingdom	80	+ 33
„ United States	19	− 9
Voltage regulators, etc.	16	+ 8
From United Kingdom	8	+ 4
„ Switzerland	2	− 1
„ Canada	5	+ 5
Regulating and controlling apparatus	102	+ 37
From United Kingdom	66	+ 31
„ United States	32	+ 2
Rectifiers	78	+ 16
From United Kingdom	51	+ 3
„ United States	25	+ 12
Static transformers under 66 kV	11	− 14
Static transformers, 66 kV and over	1	− 51
Telegraph instruments	22	− 10
From United Kingdom	9	− 3
„ United States	13	− 6
Telephones	181	+ 9
From United Kingdom	176	+ 111
„ United States	4	− 102
Telephone switchboards, automatic	50*	− 224
Telephone and telegraph switchboards and appliances, n.e.i.	765	+ 125
From United Kingdom	629	+ 147
„ United States	133	− 5
Electric vacuum tubes	5	− 78
From United Kingdom	1	− 2
„ United States	4	− 76
Radio valves	217	− 18
From United Kingdom	58	− 21
„ United States	91	− 61
„ Canada	26	+ 23
Radio receiving sets	7	− 76
From United States	4	− 66
Transmitting sets	4	− 32
From United Kingdom	2	− 5
„ United States	1	− 13
Radio parts	108	− 340
From United Kingdom	48	− 208
„ United States	56	− 110
Electrical apparatus, n.e.i.	205	+ 50

* All or mainly from U.K.

† All or mainly from U.S.A.

Next Week's Events

Monday, 15th November, to Saturday, 20th November

LONDON.—Olympia, 10.30 a.m. to 6 p.m. Public Health and Municipal Engineering Congress and Exhibition.

Monday, 15th November

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "Broadcast Engineering," by R. T. B. Wynn.

GLOUCESTER.—I.E.E. Western Supply Group, 5 p.m. "Behaviour of High-Voltage Solid-Type Cable Accessories in Service," by C. J. Armstrong and C. T. W. Sutton.

LIVERPOOL. — Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Analysis-Synthesis Telephony, with special reference to the Vocoder," by R. J. Halsey and Dr. J. Swaffield.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "What Fundamental Principles should be Illustrated in Electrical Engineering Courses, and at What Stage Should They be Introduced?" opened by Prof. J. T. MacGregor-Morris.

St. Ermin's Hotel, S.W.1, 6.40 p.m. A.S.E.E. Central London Branch. Brook Motors sound film "Distinguished Company."

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Discussion on "To what Extent does Distortion really matter in the Transmission of Speech and Music?" opened by P. P. Eckersley.

STAFFORD.—King Edward Grammar School, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Application of the Recurrent Surge Oscillograph to the Study of Surge Phenomena in Transformers," by E. L. White and W. Nethercot.

STOCKPORT.—White Lion Hotel, Underbank, 7.15 p.m. A.S.E.E. Stockport Branch. "Storage Batteries," by C. Worthy.

Tuesday, 16th November

CAMBRIDGE.—Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Address by F. Smith, chairman of the Radio Section.

DERBY.—Electricity Showrooms, 6.30 p.m. I.E.E. East Midland Centre. "Load Dispatching and the Reasons for it, with special reference to the British Grid System," by A. R. Cooper.

LEEDS.—Yorkshire Electricity Board Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilization Group. "The Design of Contactors with regard to their Industrial Application," by B. Feldbauer.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "The Measurement of Telecommunications Efficiency," opened by W. West.

Magnet House, Kingsway, W.C.2, 6.30 p.m. Joint meeting of the A.S.E.E. and the Institution of Engineers-in-Charge. "Modern Ventilating Systems," by R. H. Holbeche.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Society of Chemical Industry. Second Baekeland Memorial Lecture. "Leo Hendrick Baekeland—and the Development of Phenolic Plastics," by Prof. J. Kendall.

Caxton Hall, S.W.1, 7 p.m. Institution of the Rubber Industry. "Dielectric Heating of Rubber," by Dr. W. D. Rae.

Wednesday, 17th November

BOURNEMOUTH. — Wedgwood Café, Albert Road, 6.30 p.m. I.E.E. Southern Centre. "The Economical Utilization of Electricity in Great Britain," by R. B. Giles.

LONDON.—I.E.E. London Students' Section, 2 p.m. Visit to Johnson & Phillips, Ltd., Charlton.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. Informal lecture on "Practical Aspects of Marine Navigational Radar," by A. K. Nuttall.

Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "An Introduction to Refrigeration," by L. L. Emmett.

Thursday, 18th November

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "The Lightning Protection of High-Voltage Transmission and Distribution Systems," by H. M. Lacey.

LONDON.—Caxton Hall, Westminster, S.W.1, 2.30 p.m. Diesel Engine Users' Association. "Gas Turbines—An Introduction for the Prospective User," by R. J. Welsh.

WORCESTER.—Talbot Hotel, 7.15 p.m. Worcester Electric Club. "Interference Suppression—Broadcast and Television Aerials," by S. B. Begley.

Friday, 19th November

BIRMINGHAM.—Grand Hotel, 6.30 p.m. Midland Electrical Engineers' Association. Annual ball.

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Annual general meeting.

NEWCASTLE-ON-TYNE.—King's College, 7 p.m. I.E.E. North-Eastern Students' Section. Combined papers evening.

Saturday, 20th November

LONDON.—I.E.E. London Students' Section, 9.45 a.m. Visit to Watson X-Ray Department, Wembley.

MANCHESTER.—At the Manchester Geographical Society, 16, St. Mary's Parsonage, 2.30 p.m. Junior Institution of Engineers (North-Western Section). "The Electron Microscope," by M. Venner.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1942

S. SMITH & Sons (Motor Accessories), Ltd., and F. W. Meredith.—"Electric servo-motors and systems controlled thereby." 13685. 29th September, 1942. (611009.)

1943

Sperry Gyroscope Co., Inc.—"Radio apparatus for detecting and locating objects." 1835. 12th August, 1941. (610704.)

Furzehill Laboratories, Ltd., S. Smith & Sons (Motor Accessories), Ltd., and F. R. Milsom.—"Electronic oscillators." 6344. 20th April, 1943. (611014.)

S. Smith & Sons (England), Ltd., and F. W. Meredith.—"Means for controlling a reversible supply of electricity to a load such as an electric motor." 15849. 27th September, 1943. (611018.) "Automatic control systems." 1st October, 1943. (611019.) "Automatic electric-motor control systems." 17137. 18th October, 1943. (611020.)

1944

General Electric Co., Ltd., and L. G. Ward.—"Apparatus for balancing rotary bodies." 5824. 29th March, 1944. (610705.)

Marconi's Wireless Telegraph Co., Ltd.—"Synchronizing signal generators for television systems." 5933. 30th July, 1942. (610706.)

A. H. Stevens (Progressive Welder Co.).—"Methods of and apparatus for electric welding." 12744. 4th July, 1944. (610903.)

Marconi's Wireless Telegraph Co., Ltd. (Transradio Internacional Compania Argentina de Telecomunicaciones, Soc. Anon.).—"Thermionic control device for the control element of a variable system." 15090. 8th August, 1944. (611025.)

S. Smith & Sons (England), Ltd., and F. W. Meredith.—"Alternating-current motor control systems." 23rd September, 1944. (611026.) "Electromagnetic apparatus of the flux-gate type." 21298. 31st October, 1944. (611027.)

1945

M. Widakowich and J. L. La Cour.—"Means for the operation of gas-discharge lamps by alternating-current produced through transformation of direct-current with the aid of a current converter." 1511. 18th January, 1945. (611031.)

Hivac, Ltd., A. R. Rangabe and C. S. Wright.—"Manufacture of thermionic valves." 3051. 6th February, 1945. (611033.) "Manufacture of thermionic valves." 3052. 6th February, 1945. (Cognate application 29063/45.) (611034.) "Manufacture of thermionic valves and like apparatus having an evacuated envelope." 3053. 6th February, 1945. (611035.)

S. Smith & Sons (England), Ltd., F. W. Meredith, and D. L. Meredith.—"Systems for the control of polyphase motors from a single-phase supply." 7065. 20th March, 1945. (Cognate application 15335/45.) (611039.)

Sperry Gyroscope Co., Inc.—"Scanning apparatus for use in radio-detecting and locating systems." 8373. 12th August, 1941. (Dividend out of 610704.) (611711.) "Error signal control systems." 9521. 15th April, 1944 (610712.)

Metropolitan-Vickers Electrical Co., Ltd., F. H. Belsey, and D. T. Broadbent.—"Control systems of the correspondence kind for movable members." 14451. 7th June, 1945. (611046.)

S. Smith & Sons (England), Ltd., Furzehill Laboratories, Ltd., F. W. Meredith, and F. R. Milsom.—"Amplifying devices for electric motor control systems and the like." 16210. 25th June, 1945. (611048.)

N. E. Hewitt.—"Feeding devices for arc-lamp carbons." 17078. 4th July, 1945. (611049.)

Standard Telephones & Cables, Ltd., and E. O. Willoughby.—"Coupling arrangements between aerials and transmission lines." 21804. 24th August, 1945. (611052.)

E. Perriolat.—"Electrically driven amusement vehicles." 24216. 2nd June, 1944. (610828.)

L. Young, and A. Young.—"Electro-dynamic devices for interconverting electrical oscillations and sound waves." 26354. 9th October, 1945. (611056.)

Record Electrical Co., Ltd., and A. E. Brewerton.—"Apparatus for solving vector triangles." 26377. 10th October, 1945. (610829.)

Standard Telephones & Cables, Ltd.—"Cathode for electron-discharge device and method of producing the same." 28250. 19th May, 1944. (611058.)

M. N. Yardeny.—"Multi-revolution electrical control apparatus." 29965. 9th November, 1945. (611061.)

Radio Corporation of America.—"Colour television and photographic apparatus." 30419. 16th December, 1944. (610722.)

Marconi's Wireless Telegraph Co., Ltd., V. J. Cooper and E. Green.—"Electron-discharge tube high-frequency amplifiers and modulating circuits therefor." 32949. 5th December, 1945. (611065.)

Compagnie Electro-Mecanique.—"Devices for selective electric protection." 33701. 30th June, 1943. (610837.)

1946

Babcock & Wilcox Co.—"Electric control system." 1051. 26th January, 1945. (611070.)

Soc. Anon, pour les Applications de L'Electricité et des Gaz Rares, Etablissements Claude-Paz & Silva.—"Manufacture of electric-discharge apparatus with a gaseous content." 3040. 20th December, 1943. (610844.)

Dunlop Rubber Co., Ltd., E. F. Powell and S. W. Gough.—"Treatment of rubber and other plastic non-conductors of electricity by the high-frequency heating process." 4280. 12th February, 1946. (610732.)

M. Valente.—"Electric lamp stands." 6942. 6th March, 1946. (610736.)

F. Lobl.—"Electrically heated pads." 7546. 11th March, 1946. (610847.)

Kent Alloys, Ltd., A. F. Bandidt and J. W. P. Angell.—"Electric heating apparatus." 9889. 29th March, 1946. (611087.)

Pye, Ltd., and D. I. Lawson.—"Apparatus incorporating a cathode-ray device, particularly television receivers." 10851. 9th April, 1946. (610910.)

A. A. Cullis and H. W. Taylor.—"Device for dressing the electrodes of spot-welding machines." 10853. 9th April, 1946. (610911.)

Siemens Electric Lamps & Supplies, Ltd., and A. J. Meadowcroft.—"Electric-discharge lamps." 10964. 10th April, 1946. (610927.)

J. Lucas, Ltd., and J. A. Laird.—"Electro-magnetic clutches." 10975. 10th April, 1946. (610928.)

Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson.—"Electric-discharge tubes." 10994. 10th April, 1946. (610932.)

Philips Lamps, Ltd.—"Glass objects into which electric supply conductors are sealed." 11002. 11th September, 1941. (610933.)

Soc. Francaise Radio-Electrique.—"Radio navigation of aircraft for blind landing." 11072. 17th December 1943. (610935.)

Ferranti, Ltd., W. R. J. Mayes, and S. W. Milverton.—"Manufacture of heaters for indirectly heated cathodes of discharge tubes." 11132. 11th April, 1946. (610606.)

C. Perret.—"Electric adaptors or like connecting or distributing appliances." 11142. 13th April, 1945. (610608.)

Reyrolle & Co., Ltd., and C. Ollerenshaw.—"Electric protective arrangements for sectionalized a.c. circuits." 11152. 11th April, 1946. (Cognate application 11588/47.) (610610.)

British Thermostat Co., Ltd., and J. E. Sherlock.—"Snap-action electric switch devices." 11162. 11th April, 1946. (610611.)

Muirhead & Co., Ltd., and J. Bell.—"Synchronous electric motors." 11185. 11th April, 1946. (610615.)

A. V. Roe & Co., Ltd., and R. F. Taylor.—"Rotary welding electrodes." 11188. 11th April, 1946. (610617.)

Beethoven Electric Equipment, Ltd., and D. C. Burton.—"Kettles and like vessels incorporating

electrical heating means." 11210. 11th April, 1946. (610626.)

Austin Motor Co., Ltd., and F. W. W. Highfield.—" Automatically and electrically operated change-speed gear." 11246. 12th April, 1946. (610633.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" Methods of insulating magnetic steel." 11262. 12th April, 1946. (610636.)

Johnson, Matthey & Co., Ltd., and E. J. Wyeth.—" Electrical condensers." 11298. 12th April, 1946. (610642.)

Alltools, Ltd., and G. A. R. Tomes, and M. Tidmarsh (legal representative of A. Tidmarsh, deceased).—" Manufacture of photo-sensitive and other electron-emitting surfaces." 11304. 12th April, 1946. (610645.)

Alltools, Ltd., A. Graves and G. A. R. Tomes, and M. Tidmarsh (legal representative of A. Tidmarsh, deceased).—" Photo-electric cells." 11305. 12th April, 1946. (610646.)

Standard Telephones & Cables, Ltd.—" Electric pulse communication systems." 11329. 17th April, 1945. (610653.) " Switching arrangements for high-frequency currents." 11332. 25th November, 1944. (610654.) " Selective filtering system for electric pulse trains." 11333. 24th May, 1943. (610655.)

Farnsworth Television & Radio Corporation.—" Electron multiplier for ultra-high-frequencies." 11356. 14th April, 1945. (610662.)

D. H. Black.—" Pulse radar equipments." 11359. 12th April, 1946. (610664.)

Cable & Wireless, Ltd., A. W. H. Cole, and R. G. Griffith.—" Telegraph circuit arrangements." 11369. 12th April, 1946. (610666.)

Evershed & Vignoles, Ltd., and W. E. Deller.—" Apparatus for unwinding wire or thread." 11370. 12th April, 1946. (610667.)

M. Amsler.—" Starter mechanism for fractional-horse-power electromotors." 11412. 13th April, 1945. (610671.)

Hazeltine Corporation.—" Electrical connector." 11417. 20th April, 1945. (610673.)

General Electric Co., Ltd., and E. S. Friedlander.—" Electric ripple control systems." 11480. 15th April, 1946. (610688.)

Westinghouse Electric International Co.—" Protection of alternating-current power systems." 11482. 16th April, 1945. (610948.)

Anciens Etablissements Brisson-Neau & Lotz.—" Control systems for prime-mover electric power plant for winches, especially for use on trawlers." 11516. 12th November, 1943. (610699.)

Kockums Mekaniska Verkstads Aktiebolag.—" Vibrators for converting a direct-current in a pressure medium into an alternating-current in such medium." 11540. 28th April, 1943. (610745.)

Marconi's Wireless Telegraph Co., Ltd., and V. J. Cooper.—" Frequency modulated radio and like transmitters." 11545. 15th April, 1946. (610951.)

Decca Record Co., Ltd., and W. J. O'Brien.—" Indicating systems for electrical signals, particularly for use with radio beacons." 11556. 15th April, 1946. (610954.)

D. C. Johnson.—" Electrical pick-ups for detecting vibration." 11559. 15th April, 1946. (610750.)

G. F. McIntosh.—" Electric steam radiators." 11603. 17th February, 1941. (610757.)

W. Riggs (trading as Girdlestone & Co.), and T. C. Riggs.—" Quick make-and-break electric switches." 11623. 16th April, 1946. (610762.)

Westinghouse Electric International Co.—" Electric motor control systems." 11643. 3rd April, 1945. (610765.)

Compagnie Générale de Telegraphie Sans Fil.—" Processes and apparatus for continuous tempering by high-frequency." 11660. 12th September, 1942. (610771.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea, and A. H. Reeves.—" Multiplex electric communication systems." 11671. 16th April, 1946. (610774.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea, C. T. Scully and D. M. Ambrose.—" Arrangements for demodulating time-phase modulated electric pulses." 11672. 16th April, 1946. (610775.)

R. Haddan. (Blue Ridge Glass Corporation).—" Electric heating unit." 11681. 16th April, 1946. (610778.)

Condensateurs Blindes Soc. A.R.L.—" Method of making electric condensers and apparatus therefor." 11683. 30th April, 1945. (610779.)

Southern United Telephone Cables, Ltd., and D. J. Sinclair.—" Means for preventing the longitudinal movement of an electric cable, for example, laid in a duct." 11687. 16th April, 1946. (610782.)

Telefonaktiebolaget L. M. Ericsson.—" Telephone systems." 11724. 19th April, 1945. (610790.)

W. McEwan & Co., Ltd., and J. T. T. Ferris.—" Protective means in electrically driven power transmission gears." 11732. 16th April, 1946. (610793.)

Compagnie Electro-Mechanique.—" Selective protection arrangement in which the orders are transmitted by currents at the distributing network frequency." 11735. 24th April, 1945. (610794.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—" Rotary electric switches comprising contact-operating pressure rollers." 11778. 11th October, 1941. (610863.)

Philips Lamps, Ltd.—" Method of manufacturing filaments from tungsten." 11779. 28th October, 1941. (610864.) " Frequency-modulated transmitters." 11781. 26th November, 1941. (610865.) " Circuit arrangements for compensating the aerial effect of directional antennae." 11783. 20th November, 1941. (610866.) " Metal-glass seals." 11784. 21st August, 1941. (610867.)

W. W. Triggs (American Steel & Wire Co.).—" Electric cable." 11849. 17th April, 1946. (610881.)

P. Faure.—" Combined battery charging and engine heating apparatus for automobiles." 11854. 19th January, 1946. (610882.)

General Electric Co., Ltd., and D. C. Espley.—" Scanning of kinematograph films." 11867. 17th April, 1946. (610884.)

Chloride Electrical Storage Co., Ltd., R. Gray, and J. Seddon.—" Electric terminal connections." 11883. 17th April, 1946. (610887.)

H. Faulkner.—" Electrical means for igniting combustible materials." 11884. 17th April, 1946. (610888.)

Compagnie Générale de Telegraphie Sans Fil.—" Electron-discharge devices for amplifying oscillations of very high-frequency." 11909. 26th December, 1940. (610969.)

Cinema-Television, Ltd., M. Morgan, and G. E. G. Graham.—" Radio relaying systems for telephony, television, facsimile and like methods of transmitting intelligence." 11957. 18th April, 1946. (610977.)

Dictaphone Corporation.—" Electric phonograph." 11972. 19th April, 1945. (610981.)

British Thomson-Houston Co., Ltd., T. W. Wilcox, and A. Roxburgh.—" Electrical circuit-breakers using compressed air blow-out." 11976. 18th April, 1946. (610983.)

British Thomson-Houston Co., Ltd., and H. R. Ruff.—" Terminal caps for electric lamps and the like." 11977. 18th April, 1946. (610984.)

British Thomson-Houston Co., Ltd.—" Wire coating dies." 11978. 24th April, 1945. (610985.)

Westinghouse Electric International Co.—" Electric motor control systems." 11997. 21st April, 1945. (610989.) " Electric motor control systems." 11998. 7th September, 1944. (610990.)

Standard Telephones & Cables, Ltd.—" Selenium rectifiers." 12047. 12th May, 1945. (Cognate applications 12048/46 and 12049/46). (610999.)

Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—" Crystal filters for electrical oscillations." 12070. 18th April, 1945. (611092.)

A. Reyrolle & Co., Ltd., A. T. Robertson, J. W. Bayles, and E. R. Hanson.—" Control systems for electric power transmission systems employing synchronous alternating-current dynamo-electric machines." 22065. 24th July, 1946. (Addition to 589749). (610799.)

Philips Lamps, Ltd.—" Electric resistances." 24003. 18th November, 1942. (610800.)

1947

Philips Lamps, Ltd.—" Electric resistances." 7824. 16th June, 1944. (Addition to 610800). (610801.)

British Thomson-Houston Co., Ltd.—" Wire coating dies." 11145. 27th May, 1944. (611002.)

S. Smith & Sons (England), Ltd., and F. W. Meredith —" Electric systems for generating a control voltage for controlling a reversible supply of electricity." 33251. 27th September, 1943. (Divided out of 611018.) (611099.)

1948

Hivac, Ltd., A. R. Rangabe and C. S. Wright.—" Manufacture of thermionic valves." 7663. 6th February, 1945. (Divided out of 611034). (611101.)

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Alnwick.—18th November. R.D.C. Electric heating and lighting installations in two pump houses at Stamford; and two submersible pumps, with cable, control gear, etc. R. Rothwell, clerk, Old Court Buildings, 34, Green Batt.

Ashford (Middx.).—19th January. Metropolitan Water Board. Three generating sets at Ashford Common pumping station. Chief engineer to the Board, New River Head, Rosebery Avenue, London, E.C.1.

Belgium. — BRUSSELS. — 24th November. Belgian State Railways. Telephone cable. (E.P.D. 42649/48. Com./1299.)*

Edinburgh.—19th November. Corporation. Installation of electric light and power at Water Department, Drum Park Yard. Forms from City Architect's Office, City Chambers. Tenders to Town Clerk.

29th November. Corporation Gas Department. Workshop lighting system at Granton Gas Works. Specifications, etc., from the engineer and manager, 15, Calton Hill.

Goole.—26th November. Town Council. Electric lighting installation in the Market Hall. Borough surveyor, Municipal Offices.

Halifax.—31st December. Education Committee. Renewal of lighting installation at Modern School, Huddersfield Road. (See this issue.)

Ince-in-Makerfield.—20th November. U.D.C. Electrical installations. R. Lewis, surveyor, Town Hall.

Mitford and Launditch.—22nd November. R.D.C. Wiring twenty-five Council houses on six sites. Housing officer, The Guildhall, East Dereham.

Pakistan.—KARACHI.—21st December. Department of Supply and Development. Supply of five 3,000-kW turbo-alternators with boilers, condensing plant and auxiliaries, etc. (E.P.D. 41982/48. Com./1281.)*

Poole.—24th November. Borough Engineer's Dept. Electric conduit, wiring, accessories, etc. (See this issue.)

St. Helens.—16th November. Education Committee. Electric lighting installation, etc., at Merton Bank and Thatto Heath Schools. Director of education, Education Offices.

Siam.—BANGKOK.—16th December. Chief of Stores Division, Railway Department. Supply of 300/400-line private automatic branch exchange with accessories, and 200 subscriber sets. (E.P.D. 42842/48. Com./1296.)*

Uruguay.—MONTEVIDEO.—13th December. Usinas Electricas y Telefonos del Estado. One automatic telephone exchange and 500 telephone instruments. (E.P.D. 42555/48. Com./1301.)*

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Dagenham.—Borough Council. Accepted. Armoured underground electric cable (£1,149). —Simplex Electric Co.

Gillingham (Kent).—Corporation. Electrical installations in twenty-eight houses.—Lauray Electrical Co.

London.—L.C.C. Accepted. Electrical installation; Civic restaurant, Tooting.—Lauray Electrical Co. Hanley School, Islington.—Holmes & Larkinson. John Ruskin School, Southwark.—Reliance Electrical Co.

Oldbury.—Town Council. Accepted. Lighting of the Birmingham–Wolverhampton trunk road between Hadley Road West and Birchley Crossing.—G.E.C.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aberdeen.—New buildings for North of Scotland College of Agriculture at Craibstone, near Aberdeen; principal.

Atherton.—Houses and shops, Hag Fold estate, for U.D.C.; J. C. Prestwich & Sons, architects, Bradshawgate Chambers, Leigh, Lancs.

Barking.—Flats (186) in six blocks at Longbridge Road; borough architect.

Bedford.—Primary school, London Road; Samuel Foster, Ltd., builders, High Street.

Belfast.—New maternity unit at Corry's Buildings, Belfast City Hospital; McCarthy & Lilburn, Scottish Provident Buildings, Belfast.

Bicester.—Houses (150), Ambrosden, for War Department; R. Potter, architect, The Close, Salisbury.

Birkenhead.—Rebuilding Argyle Theatre, for T. D. Clarke; W. & Segar Owen, architects, Palmyra Square Chambers, Warrington.

Birmingham.—Library, etc., University Road, Edgbaston, for Birmingham University; Verner O. Rees, architect, 51, Queen Caroline Street, W.6.

Blackburn.—Primary school, Roman Road, for Education Committee; W. Pickstone, borough engineer, Town Hall.

Border.—Electrical installations in 20 houses at Parkhead, Brampton; R.D.C. surveyor, Carlisle.

Bradford.—New workshops for Jowett Cars, Ltd.; Howard V. Lobb, architect, 20, Gower Street, W.C.1.

Brierley Hill.—Houses (40), Dunns Bank estate, for U.D.C.; J. R. Moore, architect, The Council House.

Brigg.—Houses (48), Woodbine estate, for U.D.C.; Buttrick & Buttrick, architects, 43, Oswald Road, Scunthorpe.

Colne.—Houses (48), Whitefriar Street; borough engineer.

Coventry.—Completion of restoration after war damage and extensions to King Henry VIII School (£20,000); D. E. E. Gibson, city architect, 1a, Warwick Row.

Esher.—Dwellings (66), Sugden Road, Hinchley Wood; U.D.C. surveyor, Council Offices, Esher, Surrey.

Eton.—Houses (100), for R.D.C.; Sir John Brown, A. E. Henson & Partners, architects, 117, Sloane Street, London, S.W.1.

Framlingham (Suffolk).—Extensions to Framlingham College; W. C. Reade, Ltd., builders, 74, High Street, Aldeburgh, Suffolk.

Glasgow.—New sawmill, etc. (£100,000) for Brownlie & Co., Ltd., City Sawmills, Craighall Road; manager.

Hastings.—Flats (72) in 18 blocks, Rock Lane and Red Lake sites; S. A. Gregory, Ltd., builders, 27, Chapel Road, Worthing.

Hersham.—Extensions to works; Exchange Tyre & Rubber Exports, Ltd., Mitre Chambers, Mitre Street, E.C.3.

Heywood.—Houses (300), Crimble Hall estate; Col. C. E. Hartley, Crimble Hall.

Hove.—Flats (105), Melrose Hall site, Wilbury Road; Royal Masonic Benevolent Institution, Great Queen Street, Holborn, London, W.C.2.

Hull.—Factory and offices, Waverley Street; T. Whittick & Son, Ltd., Cogan Street.

Ipswich.—Technical college; Johns & Slater, architects, 8, Lower Brook Street.

Liverpool.—Factory in Rose Place; J. L. Griffiths, architect, 14, Castle Street.

Llanelly.—Extensions to General Hospital; Sir Percy Thomas & Son, architects, 10, Cathedral Road, Cardiff.

London.—FINSBURY.—Block of dwellings, Killick Street, for B.C.; Messrs. Tecton, architects, 29, Sackville Street, W.1.

PORTLAND PLACE.—Rebuilding Queen's Hall, Langham Place, for Chappell & Co., Ltd.; Joseph Emberton, architect, 121, Chiltern Court, N.W.1.

ST. PANCRAS.—Office block, 7-12, Tavistock Square; plans, Ministry of Works, Abell House, John Islip Street, S.W.1.

Middlesbrough.—New primary school on the Thorntree estate and new Middle Beck secondary school for the E.C.; education architect, Woodlands Road, Middlesbrough.

Houses (98) for the T.C.; builders, J. Gilmore & Sons, Middlesbrough (50 houses); J. C. Watson, Stockton-on-Tees (28 houses); and R. H. Bailey & Son, Middlesbrough (20 houses).

Middleton.—County secondary modern school, Moorside estate, for Lancashire Education Committee; G. Noel Hill, county architect, County Offices, Preston.

Newcastle-on-Tyne.—Substation, garage, etc., at factory, Coast Road; Imperial Tobacco Co. (of Great Britain & Ireland), Ltd., Bristol, 3.

Newport (Mon.).—Workshops, offices, etc., Liswerry Road; J. H. Venn, Ltd., builders, 2, Chepstow Road.

Northampton.—Showrooms and works, Bridge Street and Cattle Market Road, for Wood Bros. & Runham, Ltd.; W. Rosser, architect, 20, Derngate.

North Riding.—Electrical installation at Whitby Youth Club; county architect, County Hall, Northallerton.

Nottingham.—Extensions to Hospital for Women, Peel Street; Gilbert & Hall, builders, Wharf Road, Castle Boulevard, Nottingham.

Oldham.—Crematorium; A. L. Hobson, borough engineer, Municipal Buildings, 75, Union Street.

Oswestry.—Reconstruction of Robert Jones & Agnes Hunt Orthopædic Hospital; Ford & Weston, builders, Osmaston Road, Derby.

Oxford.—New Nuffield college; Harrison, Barnes & Hubbard, architects, 3, Southampton Place, London, W.C.1.

Plymouth.—Modern secondary school, Honicknowle, for E.C.; Louis de Soissons & Partners, architects, 11, The Crescent.

Portsmouth.—Houses (102), Leigh Park (£154,927); H. E. Collins, builders, West End estate, Redlands Road, Fareham.

Reading.—R.C. church, Park Lane, Tilehurst; Stewart & Sutcliffe, architects, 5, Hinton Road, Bournemouth.

Technical college for E.C.; Lanchester & Lodge, architects, 10, Woburn Square, W.C.1.

Waterworks depot, Berkeley Avenue, for T.C. (£40,000); borough architect.

Redcar.—New works; Dorman, Long & Co., Ltd., Middlesbrough.

Ruislip.—Houses (44), Gardens estate, for Acton Corporation; borough engineer.

St. Albans.—Factory, Sandridge, for Transplanters, Ltd.; R. Jellink-Karl, architect, 22, Chancery Lane, W.C.2.

Scalby.—Primary school for North Riding E.C.; W. Tocher, architect, 8, Blenheim Terrace, Leeds.

Scarborough.—Rebuilding central tramway station, Marine Parade; T. W. Whipp, architect, 15, Valley Bridge Parade.

Scunthorpe. — Crematorium; C. Cooper, borough surveyor, Municipal Buildings.

Stirling.—Five blocks of class-rooms at Riverside School; county architect, Stirling.